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Comparing sixth grade students' creativity in word play to spatial construction with integrated academic content eliciting a distal or proximal perspective

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COMPARING SIXTH GRADE STUDENTS' CREATIVITY IN WORD PLAY TO SPATIAL CONSTRUCTION WITH INTEGRATED ACADEMIC CONTENT ELICITING A DISTAL OR PROXIMAL PERSPECTIVE

An Abstract of a Dissertation

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Doctor of Education

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ABSTRACT

Pressing global problems require solutions from innovative ideas that depend upon educating a new generation to think creatively. The current study aimed at assisting 24 sixth grade students in a summer program develop their creativity skills in two different areas while integrating academic content. Student performance was examined for transfer of skills across domains and for support of Construal Level Theory, which holds that addressing topics distant in space, time, probability or experience leads to abstract thought supporting greater creativity.

The study was a counterbalanced, repeated measures, two-experimental condition study with students divided into two groups of 12 each. In one experimental condition, students learned about creative word play (e.g., hink-pinks, alliteration, homophones) and wrote short compositions, while in the other condition, they learned about creative spatial constructions (given a set of 12 recycled or craft items, students used glue to create a three-dimensional scene that represented specified academic concepts). Each group completed identical pretest-posttests addressing both conditions. Both groups discussed a given sheet of content information (changing daily, alternating between proximal and distal topics) to incorporate into work and daily instruction on creativity skills. Written and constructed products were scored for creativity skills including fluency, originality, and elaboration, among others.

Both groups scored similarly on the pretest. The group participating in construction lessons the first two weeks performed better in the ensuing daily wordplay lessons than the group who had first engaged in wordplay, indicating possible transfer of

creativity across domains. However, such transfer was not seen to occur from the group first learning wordplay and continuing into construction. This implies that the hands-on, spatial activity of construction may positively enhance the creative mindset of students.

Little evidence was found in scoring of the wordplay and construction products to support Construal Level Theory. Instead, many creative traits, along with student attitudes, were enhanced under the proximal condition, often with large effect sizes. Perhaps the fact-and-drill-oriented school expereinces of participants affected their creative performance on unfamiliar (distal) topics. Conversely, the observed effects may have been due to integration of proximal or distal content rather than priming as in other studies.

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INTRODUCTION

The world faces many pressing problems today such as global climate change, overpopulation, scarcity of resources, deforestation, loss of habitats, pollution, crime, economic upheaval, unemployment, and the threat of devastating diseases such as AIDS and Bird Flu. The solution to these crises will need to come from innovative ideas that change the way things are currently accomplished. These new ideas, in turn, depend upon educating a generation that thinks creatively. There is evidence from two longitudinal studies (Delcourt, 1993; Moon & Feldhussen, 1993) that participation in a creatively – oriented gifted program leads to later adult productivity. Because of this and other amassing evidence for the importance of creativity to economic success (e.g., Wolfe & Bramwell, 2008), several systems of "21st Century" skill sets (e.g., Education Connection, 2012; Partnership for 21st Century Skills, 2011) have been developed to prepare younger citizens for the challenges of the future. Therefore, the research project presented here describes a curriculum aimed at helping students develop their creativity skills in two different areas while applying them to academic content.

Researcher's Personal Interest in the Topic

It appears that there is no place for creativity in today's schools. Teachers have been forced to teach to high stakes tests – a part of the accountability movement in which not only students, but teachers and schools are ranked and categorized (McNeil, 2000) (find more recent references). Instructors often have resorted to teacher-centered dull repetition and drill in an effort to control the curriculum to improve student performance

(Au, 2007). At some schools, in an attempt to raise students' mathematics and reading scores, science and social studies lessons have been replaced by additional focus on mathematics and reading (Taylor, Shepard, Kinner, & Rosenthal, 2001). Because of this situation, creative skills were pushed even further down the list of instructional priorities (Clark et al., 2003). Urban school districts (like the one from which students in the sample population for the current study derive) have been disproportionately affected by the No Child Left Behind Act (Rentner et al., 2006) by reducing arts integration and focusing more on direct instruction or drill.

The researcher was interested in how creativity skills can be integrated with academic content so that all students have the opportunity to enhance their creativity. For example, Spohn (2008) found that both arts teachers and non-arts teachers in a rural Ohio district reported loss of instructional time from the arts, a place in the curriculum in which creativity skills are often addressed. Additionally, the schools most likely to eliminate the arts are urban schools identified for No Child Left Behind improvement and those with greater low-income or minority enrollments (United States Government Accountability Office, 2009). Because the already-crowded elementary curriculum is being reduced to focus on subjects addressed by tests (Hannaway & Hamilton, 2008), there seems to be little space for teaching creativity. The researcher wonders, however, if creativity skills might be integrated with the academic content being taught and if so, can these skills learned in one domain be transferred to other domains? The findings of previous literature on whether creativity skills can be transferred from one domain to another are uncertain (Beghetto, 2008).

Another important development in the area of creativity is a relatively new psychological theory called Construal Level Theory (Trope, Liberman, & Wakslak, 2007), which states that an individual's focus on near (proximal) or distant (distal) content affects the level of mental activity as concrete or abstract. When a person is thinking abstractly, a few recent research studies have shown that creativity is enhanced (e.g., Liberman, Polack, Hameiri, & Blumfeld, 2012). How might the idea of greater student creativity when contemplating distal concepts be tested through integration of proximal and distal academic content with creative exercises?

Finally, the researcher was interested in how students perform and enjoy the integrated creative activities including how they perceive their levels of creative production. Comparison of student performance in two distinct domains is also of interest.

Statement of the Problem

An important current question in gifted education is whether creativity is transferable across domains (Beghetto, 2008); although there is some existing evidence, currently published results are inconclusive, warranting additional studies. A second issue pertains to a newer theory of human psychology, Construal Level Theory (Trope & Liberman, 2010), which postulates that mental operations and behaviors are related to whether the stimulus is perceived as distant or close in time, space, probability and/or society. A few recent research studies indicate that this construct affects creativity, but more work in this area is needed.

Research Questions

The following research questions were investigated:

1. Can creative strengths be transferred from one domain to another?
2. Do students evidence more creativity when the applied academic content area is perceived as distant (distal) in time, space, probability and society from them as compared to close (proximal) in time, space, probability and society as claimed by previous studies?
3. What strategies do students use to integrate academic content with creative products?
4. How do students perceive their levels of creativity in the products they make?
5. How do students report their enjoyment of the creative process as the project progresses?

Relevant Terms Defined

This section of the dissertation defined terms significant to the study. It is important to have clear definitions of terms to ensure the problems addressed in the research are truly existing problems and not a matter of incorrect definition. Also, well-defined terminology assists the reader in better understanding the issues behind the problem and comprehending the research methods used to answer the study's questions.

1. *Word play* (2012): "Clever or subtle repartee; verbal wit; play on words or pun."
2. *Hink-pink* (2012): "Hink-pink or hinky-pinky is a word game that consists of a question or clue with an answer consisting of two words that rhyme. If the answer is two single-syllable words, it is a 'hink-pink'; an answer of two words of two

syllables each is a 'hinky-pinky'; and if the answer is two three-syllable words is a 'hinkety-pinkety.'"

3. *Alliteration* (2012): "Alliteration , the repetition of the same starting sound in several words of a sentence."
4. *Assonance* (2012): "Assonance is repetition of vowel sounds to create internal rhyming within phrases or sentences, and together with alliteration and consonance serves as one of the building blocks of verse."
5. *Homophone* (2012): "A homophone is a word that is pronounced the same as another word but differs in meaning. The words may be spelled the same, such as rose (flower) and rose (past tense of "rise"), or differently, such as carat, caret, and carrot, or two and too, or "know" and "no.""
6. *Repeated Measures Research Design*: "A design in which a single sample of subjects is used for each treatment condition" (Price, 2000).
7. *Creativity*: "Creativity is the interaction among aptitude, process, and environment by which an individual or group produces a perceptible product that is both novel and useful as defined within a social context" (Plucker, 2004, p. 90).
8. *Transformation*: "the ability to adapt something to a new use; see new meanings, implications, and applications; or creatively change one object or idea into another" (Davis, Rimm, & Siegle, 2011, p. 211).
9. *Construal Level Theory:* A psychological theory that takes into account the individual's perception of the closeness or distance of objects, events, or other individuals and how this perception influences mental operations and behaviors

(Trope et al., 2007). This theory states that distant objects, events, or individuals are mentally represented as abstract, broad concepts; whereas close objects, events, or individuals are perceived as having concrete, specific observable features. Construal theory can be applied to morality, self-control, self-presentation, congruence of goals and wellbeing, biased perceptions of expertise, coping, resilience, negotiations, insight, and creativity, among other areas.

10. *Constructions of a Given Set of Recycled and Craft Items*: A creative problem-solving activity in which a participant is given a set of items to be transformed by cutting and gluing into an object or scene that fits with a given theme (Rule et al., 2011).

11. *Word Play Materials*: Several sets of hands-on materials consisting of objects, word cards, definitions, or letters that can be arranged in a chart-like fashion to organize ideas related to phonics or semantics. Similar materials are shown in Rule and Barrera (2003; words with multiple meanings) and Rule, Stewart, and Haunold (2005; phonics sets).

12. *Productive Thinking:* A creative thinking skill technique that is part of the *Talents Unlimited Thinking Skills* that involves four steps: (1) generating many ideas; (2) putting the ideas into categories and then generating more categories or additional ideas for categories; (3) generating unusual ideas; (4) adding details to the ideas to improve them (Schlichter & Palmer, 1993, 2002).

Chapter Summary

Unfortunately, today, the importance of creativity to success is underestimated. Even though many important global problems require innovative and creative solutions, test-oriented education limits the opportunities for teachers to integrate creativity-enhancing activities into school work. One of the goals of this study was to show how activities for developing creative skills may be incorporated into daily schoolwork. Additionally, the current study sought to determine if creative skills may be transferred from one area of study (domain) to another. If so, additional advantages of teaching creative skills might be demonstrated. The other major question addressed in the current study was whether psychologically distant (distal) content positively affected student creative performance. The researcher also investigated two areas in which creativity skills may be integrated into classroom work: (1) creative constructions related to science and social studies content and (2) creative wordplay.

Now that relevant terms have been defined, the next chapter discusses recent professional literature related to the topic, building a theoretical framework for the investigation. Chapter 3 presents the design of the study. Chapter 4 provides the analyzed data of the study with brief discussion and interpretation, while Chapter 5 gives conclusions and recommendations.

CHAPTER 2

LITERATURE REVIEW

This chapter discusses major theoretical ideas supported by studies from the field of creativity education. It includes information about the 21st century skills movement because this set of thinking skills is currently being incorporated into many school curricula. This set of skills, of which creativity is an important part, is intended to help students adapt better to the challenges of a rapidly changing society.

The section called "Current Issues in Creativity" reviews contemporary problems in the field, noting areas that require more research. This section discusses studies conducted in the area of general versus domain specific creativity, an issue addressed in the current study. The section also includes information on methods of creativity assessment and context. The current study employed several strategies as described in this section.

The theory underpinning creative transformations is explored next. This topic is vital to the study, because the students were asked to transform objects in one treatment (the creative constructions) and words in the other (word play). At first, the contributions of J. P. Guilford are discussed and applied to this study. The recent recognition of the importance of transformation served as another theoretical base for the study as wordplay and problem- solving through creative constructions were the two experimental treatments involving transformation.

The final section of the chapter explores the effect of spatial, temporal, social and probabilistic distances on creativity through Construal Level theory. This section

provides the theoretical framework for one of the questions the current study answered: "Do students evidence more creativity when the applied academic content area is perceived as distant (distal) in time, space, probability and society from them as compared to close (proximal) in time, space, probability and society as claimed by previous studies?" This study design expands the work of previous studies discussed in the section.

21st Century Creative Thinking Skills

The 21st century skill movement focuses on the skills students need to perform successfully in a rapidly changing, highly technological, global society. These skill sets include ways of thinking, ways of working with others, tools for working, and skills for living in the world (Assessment & Teaching of 21st Century Skills, 2012). Creativity and innovation skills are part of the Partnership for 21st Century Skills program (2011) and involve thinking creatively, working creatively with others, and implementing innovations. Thinking creatively, according to this system of skills, includes using a broad spectrum of creative techniques to generate ideas that are valuable to the problem and analyzing, refining, and evaluating these ideas to improve and maximize the creative outcomes. Creativity and innovation form one of the six critical skills that are identified by the Education Connection (2012) as forming the foundation of 21st century success. Problem solving is also identified as another of these six skills along with information literacy, collaboration, communication, and responsible citizenship.

Bernie Trilling and Charles Fadel, authors of a recent book (2009) on 21st century skills, described how researchers are trying to look into the future and predict what skills

and qualities are going to be important. Twenty-first century skills are crucial for a person to master if he/she wants to be employed and receive a reasonable salary. Creativity and innovation (applied imagination and invention) form one of the parts of Trilling and Fadel's 21st century skill set, along with critical thinking, communication, and collaboration. According to these authors, every day the number of jobs that involve routine and simple tasks, as well as employment requiring manual labor is rapidly decreasing. One of the reasons is automatization of routine and physical tasks. Thus, more and more jobs require employees to be highly educated, have good communication skills, complex thinking skills, and creativity.

Trilling and Fadel (2009) state that, unfortunately, there is a lack of attention to developing creativity and innovation skills in today's schools. They indicate that the reason for this is partly because of the common misconceptions people have concerning creativity. For example, many people think that creativity is only a genius's prerogative or it cannot be developed and measured. The authors state that creativity and innovation skills can be nurtured by learning environments that foster questioning, patience, and openness to new ideas or ways of working. Here is where the close bond between creativity and problem solving skills is visible. Life brings new challenges and situations in which people have to react in a timely manner to generate new ideas or multiple ways to solve a problem. The focus of the current study was the development of students' creative skills in conjunction with academic content. This work may serve as model for classroom teachers to apply in integrating creativity skills with their regular academic instruction. The next section presents creativity theory and its development. It is

important to see how the creativity theory has developed and how creativity can be taught and encouraged.

Creativity Theory

Wallas's Stages

Over time, the definition and components of the creative process have undergone significant changes. An early approach identified by Graham Wallas (1926) has been considered to be traditional and foundational. It included four stages of solving a problem creatively. The stages were: (1) the preparation stage, in which the solver defined the problem and its requirements and gathered relevant information; (2) the incubation stage, during which the person's mind unconsciously worked on the problem while the person was engaged in generally non-demanding tasks such as sleeping, exercising, or reading; (3) the illumination stage, which brought a sudden awareness of a solution to the problem; and 4) the final verification stage, in which the solver checked the viability of the solution.

Torrance's Early Studies in Creativity

E. Paul Torrance is a well-known figure who actively investigated the field of creativity for many decades. Many of his early research findings laid an important foundation for operational principles in the field of gifted education and enrichment. These studies (Torrance, 1963) included: the study of Training in Principles and the study of Motivation for Quantity vs. Quality, which are described here. In his book, *Education and the creative potential*, (Torrance, 1963) Torrance also describes two significant studies, conducted by his colleagues: the study of Unevaluated vs. Evaluated Practice

(Schenitzki, 1961 as cited by Torrance, 1963), and the study called Creativity Training and Improvement of Creative Writing (Myers, 1960 as cited by Torrance, 1963).

The study of Training in Principles (Torrance, 1963) was an experimental study conducted to discover if instructing children in grades K-6 during a twenty minute period to apply a set of Alex Osborn's principles (1957) would improve the quality and quantity of children's creative ideas. Osborn's principles used to generate new ideas were: making an object smaller/ larger, rearrangement, combination, adapting, changing color, giving motion, giving odor, changing shape etc. One group of students (the experimental group) practiced the principles on two items. The first item was concrete and concerned the improvement of a toy fire truck. The second item was abstract and involved the improvement of a square. The control group did not receive any instruction or training. On the posttest, both groups were asked to improve a toy stuffed dog. The research results indicated that in all grades (K-6), children displayed a consistent tendency for the experimental group to produce a greater quantity of responses, which also were more flexible and original in comparison to the control group.

The experimental set up of the study of Motivation for Quantity versus Quality (Torrance, 1963) was the same as in the study of Training in Principles (Torrance, 1963). One group of children was asked to produce as many ideas as possible, and the second group was asked to think of the clever, interesting and unusual ideas (ideas of greater quality). This study showed that in the early grades (K-2), students who were asked to produce better quality ideas, were observed to be more motivated, in comparison to the other group, which was asked to produce a greater quantity of ideas. The results for the

third through six grades were found to be reversed, indicating that older students can see value in generating a multitude of ideas from which to choose the best idea.

The study of Unevaluated vs. Evaluated Practice (Schenitzki, 1961 as cited by Torrance, 1963), involved using a task in which students added lines and details to a shape or figure to make a picture. Both groups of children received helpful suggestions while practicing the tasks. However, the experimental group was assured that their practice work would not influence their chances to win the prize during the final test round. This experimental group also received instruction designed to encourage them to produce creative and elaborate ideas. The control group received neither the instruction encouraging production of creative and elaborate ideas, nor assurance that the work done during practice would not influence their chances to win the prize at the final test round. The results indicated that unevaluated practice is in general more appropriate for elementary school students in terms of increasing the level of creativity and elaboration of their products.

The study called Creativity Training and Improvement of Creative Writing (Myers, 1960 as cited by Torrance, 1963) was a randomized study, in which a randomly chosen half of a class was given intensive training in creative thinking during four months, but they received no training in creative writing. The other half of the class, which served as a control group, was given training in convergent problem solving. According to the results of this pretest–posttest study, students who received preparation in creative thinking showed greater growth in creative writing, in comparison to the control group.

Torrance (1962) had already identified several crucial issues in creativity that are still recognized today. For example, he stated that there is a problem with schools having students learn by authority (through memorization of given facts), rather than having them learn creatively (through inquiry or experiment). Torrance found that creative learning (learning by questioning, exploring and experimenting) was more effective than learning by authority. Torrance (1962) also determined that teaching students creative skills integrated with academic content resulted in them acquiring the same set of skills and knowledge as students exposed to traditional education methods. Additionally, according to Torrance (1962), education in creative thinking skills is helpful to students in their life after graduation. He indicated that a finding revealed in several of the studies described in his book (Torrance, 1962) was that teachers resented and resisted teaching creative thinking skills at all levels of education.

Creative Problem Solving Model

Later, Alex Osborn's (1963) Creative Problem Solving model appeared. Osborn's model served as a base for Sidney Parnes's (1981) and Donald Treffinger's with Scott Isaksen's (2005) models. The last revision of these models included six steps: (1) mess-finding – identifying a problem that needed solution; (2) fact-finding – listing everything known about the issue; (3) problem-finding – tabulating various ways of defining the problem; (4) idea-finding – brainstorming ideas for the problem's solution; (5) solution-finding – identification of criteria necessary to a good solution; and (6) acceptance-finding – determining how to implement the best ideas.

Piirto's Contribution

Jane Piirto's (2004) model of the creative process had steps in common with Wallas's model and the Creative Problem Solving model. Her model was built on seven "I's" (seven words with initial letter "I") of the creative process. Those include Inspiration, Imagery, Imagination, Intuition, Incubation, Insight, and Improvisation. Each of these terms are discussed first and then an example of the sequence of their use in making a creative product is described.

According to the author, "In terms of creativity, inspiration provides the motivation to create" (Piirto, 2004, p. 49). Inspiration may come from a work of art, from dreams, seeing new places (travelling), etc. Piirto (2004) stated that mental imagery was an important part of the imagination process. She acknowledged that imagery is an ability to mentally represent objects or events, or people accurately with a certain level of detail. "Imagery is essentially spatial and, as such, concrete evidence of the mind's power to construct" (Piirto, 2004, p. 60). Piirto (2004) discussed two types of imagination: reproductive and productive. Reproductive imagination involves using memory of events or objects that were seen by a person, while the productive imagination includes not only using memories, but creating concepts that are absolutely new.

Intuition is a feeling that something needs to be done in a certain fashion, even though no visible logic or knowledge base can justify it. Piirto states that intuition cannot be verified by scientific or empirical ways, however she thinks that a lot of people who are considered very creative follow their intuition when working.

Incubation is included as a stage in several strategies for generating creative ideas (Michalko, 2001). During this stage a person is at rest or shifted to a different activity unrelated to the problem on which he/she is working. However, when one is focused on something else, the work on solving the "main" problem is still going on at the back of one's mind. Later, in a moment unrelated to the problem, the brain consciously releases the solution to the problem. Incubation is often a stage that precedes insight. Insight is usually unexpected. Piirto (2004) states, that hard work preceding an insight is vital for it to happen. Insight can be used for solving ill-structured problems, and relies on conceptualization. The author noted that insight employs both new and preexisting information. Finally, Improvisation requires an attitude of playfulness. One must be lost in imagination, creating fluid ideas that form and reform as connections are made. Her model was improved by Davis et al. (2011) who added "Implementation" into the list of "I's".

An example of how Piirto's seven I's track the creative process can be seen in the work of a choreographer devising a new dance for a musical. First, the choreographer may seek Inspiration by looking at videos of other dances or paintings related to the topic of the musical. Suddenly, he or she gets an idea and may sketch arrangements of dancers making connections to images he or she had seen (Imagery). Then the person takes time to imagine various formats and actions for the performance (Imagination). The choreographer may have a feeling of what will work best (Intuition). Sometimes the person leaves the choreography work for a while to engage into other activities, allowing the unconscious mind to continue to solve the problem (Incubation). At a later time the

solution to the choreography problem may suddenly become apparent (Insight). The dance team practices the routine, and the choreographer asks them to improvise because some effective new moves may emerge before the dance is finalized (Improvisation).

Other Models of Creativity

Not all creativity models involve a sequence of stages. Different definitions of creativity cause diverse definitions of the creative process. For example, Mihalyi Csikszentmihalyi and Rustin Wolfe (2000) stated that the creative process was a system including three parts: (1) knowledge of the rules and procedures of the domain; (2) consideration of the views and ideas of professionals of the domain; and finally, (3) the unique and valuable contribution of an individual to the field which is approved by the professionals of the field.

There are many more theories of creativity that currently exist. For example, the central point of creativity viewed by Michael Michalko (2001) was that the volume of ideas produced by an individual determined his/her level of creativity. The more ideas an individual produces, the more likely he/she will find a unique and useful idea among them. Michalko's theory connects with the *Talents Unlimited* thinking skill system of Carol Schlichter and Ross Palmer (2002). Their way of producing creative ideas focuses on the four steps of the productive thinking talent: fluency – generating many ideas; flexibility –thinking of ideas from different categories, adding new categories, and additional ideas; originality – coming up with unusual or "off-the-wall" ideas; and elaboration – adding details to improve and extend the ideas already generated. By using productive thinking or a similar system to generate ideas, one produces a multitude of

possibilities. Michalko's point is that when the pool of ideas is larger, the chances of finding a good idea among these ideas increases.

The design of this study was based on ideas from several of the creative theories mentioned previously. The central ideas of the study include teaching students to connect and combine unrelated items during the constructions of recycled and craft materials, and connecting the content information to their writings or constructions. Students were encouraged to derive inspiration from the clipart images on the given academic content page, to use their imaginations, to add details through elaboration, to examine a problem from different angles, to take time to conduct mess-finding and notice the problem, and to engage in idea generation.

Additionally, this study was greatly influenced by several ideas of E. Paul Torrance used in assessing creativity on his well-known Torrance Test of Creative Thinking (Torrance, Ball, & Safter, 1992). For example, a very important creative skill, "resistance to premature closure," was identified by Torrance and colleagues (1992, p. 13). Torrance considered this ability of not using the first more-or-less appropriate idea generated and not closing off the idea-generation process to be an important creative strength. Individuals who exhibit resistance to premature closure take enough time to generate many ideas, choosing the less commonly-used ones. Otherwise, an individual runs the risk of missing truly exceptional ideas. Other creative strengths recognized by Torrance and his colleagues included fantasy; emotional expressiveness; movement or action; storytelling articulateness; three-dimensional visualization, unusual, or internal visualization; humor; artistic richness and sensory appeal of images, and breaking

boundaries. Participants of this study received instruction on creativity that included many creative strengths of Torrance. The activities that were offered to participants of the study included two challenging assignments with well-defined goals that helped students develop their academic knowledge base, domain-specific skills, and creative thinking skills. These structured features of the activities are important in stimulating students to experience the state of "flow."

Csikszentmihalyi's Flow

According to Mihaly Csikszentmihalyi (2008) "flow" is an experience occurring when a person is challenged to perform skills at a high level to accomplish something difficult, yet meaningful. Mihaly Csikszentmihalyi (2008) stated that when an individual experiences "flow," he/she is guided by an intrinsic feeling of "knowing what to do" to reach the goal. The individual is not easily distracted by his/her environment because he/she is totally involved into the process of creation. The person also may feel being in harmony with other participants. It was hoped that the sixth grade participants in this study were so engrossed in the creative process that they experienced flow.

Current Critical Issues in Creativity

As mentioned previously, creativity is a complex, multidimensional construct making its assessment difficult. Ronald Beghetto (2008), authored a chapter on currently important research issues related to creativity enhancement in a comprehensive volume titled *Critical Issues and Practices in Gifted Education* (Plucker & Callahan, 2008). He wrote that researchers still have not reached an agreement on several problems related to the nature of creativity. Two of the currently controversial issues are: (1) the relationship

between domain specific creativity and domain general creativity; (2) measuring/ assessing the impact of an intervention on a participant's level of creative performance.

General versus Domain Specific Creativity

Beghetto (2008) indicated that a creativity assessment tool or method needs to be chosen carefully to match the level of specificity of domain. The assessment tools for domain-general creativity will not suit domain-specific creativity, because they will not register all the features significant to a particular domain. According to Plucker (2004) domain-general creativity needs to be assessed with more general psychometric measures like creativity checklists, while domain-specific creativity requires use of more subjective measures directly related to the field such as performance assessment. Therefore, for the current study, a rubric was developed with both domain-general and domain-specific measures.

An important question is "If a student shows creativity in one domain such as literacy, would that student also be creative in another domain such as science or across many or all domains?" This question is vital because if a student's creativity is specific to one area, then it would be best to focus attention on developing that fully rather than spending time and effort across domains. However, if creativity is broader, it might be better to spend efforts developing general skills.

To begin to address part of the preceding question, the current investigation examined the relationship between student creative performances in two areas: word play (literacy area) and three-dimensional constructions (spatial ability area). The

counterbalanced design of the study and the pretest-posttest controls assisted in determining if students performed at the same level of creative production in both areas.

Creativity Assessment and Context

Another important current issue in assessment of creativity is the reliance of school personnel on a single creativity measurement instrument to determine if an individual qualifies for gifted education programming. Confining evaluation to a narrow aspect of creativity introduces bias into the assessment because creativity is a multidimensional concept and thus requires multiple measures (Beghetto, 2008). Beghetto (2008, p. 147) listed a wide variety of creativity measurement and assessment instruments available: divergent thinking tests (i.e. Torrance Tests of Creative Thinking; Torrance, 1966); self-report checklists (i.e. Group Inventory for Finding Creative Talent, Rimm, 1980); teacher ratings of student (i.e. Scales for Rating the Behavioral Characteristics of Superior Students; Renzulli, Smith, White, Callahan,& Hartman, 1976) and instruments that assess the creativity of products (i.e. Creative Product Semantic Scale; O'Quin & Besemer, 1989). A special assessment rubric was developed and used in the current investigation, for evaluating both domain general and domain specific creative traits of the product. Additionally, each student's productive thinking list of ideas was assessed using the rubric mentioned previously. Finally students assessed their own creativity level daily using a scale 1 through 10 where 1 meant not creative at all and 10 meant very creative.

Finally, Scott, Leritz, and Mumford (2004) and Beghetto (2008) noted that current research in creativity has one more limitation: the failure to consider important contextual

factors like environmental opportunities, or preexisting experience and knowledge. For example, students with family or community backgrounds of always being directed in their behaviors without consideration for individual desires or opinions, may not generate many creative ideas. Even when students produce an original idea, they may be hesitant to share it.

To support these students during each lesson, the researcher provided an information sheet focused on the current lesson topic. The fact sheet was meant to provide students with concepts and definitions they could choose to use or not to use in their creations. This information helped students in case they did not have enough factual background knowledge on the topic, as well as providing a base for accessing their previous knowledge and experience concerning the topic, reducing possible psychological stress and boosting confidence. Each day, prior to the creative wordplay or construction exercises, the researcher facilitated a discussion related to the theme of the lesson. Students were encouraged to share their personal experiences related to the topic and discuss their preexisting knowledge with peers. The researcher consistently worked to build trust and rapport with students by acknowledging and praising students' efforts, creative ideas, and positive interactions. The researcher also attempted to make sure students were respectful and appreciative of each other facilitating a comfortable psychological climate.

Creative Transformations

Guilford's Work

Guilford and colleagues conducted ground-breaking work on the nature of intelligence as multidimensional with identification of many components (Guilford, 1967; Guilford & Hoepner, 1971). His model of the Structure of the Intellect (SI), though no longer an accepted model of cognitive functioning, did highlight the distinction between convergent and divergent production and brought attention to the numerous varied mental operations people perform and ways of assessing them for job-screening and other purposes. His SI model was shown figuratively as a cube with three different dimensions: operations, content, and products. The "operations" or general intellectual processes of his model included cognition, memory recording and retention, divergent and convergent production, and evaluation. "Content" referred to broad areas of information such as figural, symbolic, semantic, and behavioral types. The last dimension, "products," resulted from applying mental operations to mental content. Products included units, classes, relations, systems, implications, and transformations. The concept of the last product, transformation, can be applied to the products being made in both conditions of this study, as explained in the next paragraph.

Types of Transformations

"A transformation is any kind of change in information. We may observe the change as it happens, as in a drama or motion picture, or we may know the item before and after a change, which gives us the knowledge that a change has occurred" (Guilford, 1977, p. 37). Transformations may occur in any content area with many different types of

products. Guilford highlighted several types of transformations as particularly important. *Figural transformations* involve a change in the spatial orientation of a figure or drawing or a new image produced from a figure by the addition of lines, shapes, or shading. In this study, the creative constructions were a type of figural transformation because the given objects were cut, folded, rearranged, and glued to make a new construction. *Symbolic transformations* include deciphering scrambled words along with spoonerisms, phrases in which the speaker interchanges letters or syllables (e.g., "rhyme-and-ding corresponds to "diamond ring"). In the current investigation, students were engaged in word play exploring spoonerisms and other verbal transformations such as hink-pink rhyming words that involved substitution of a new initial sound to make a rhyming pair (e.g. green bean), various vowel change word pairs (e.g. van to vane, twin to twine or swan to swine), and substitution of ending sounds (e.g. bus - buzz or gram - grass). *Semantic transformations* refer to a substitution of meaning. In language, this happens when a word has multiple meanings and one meaning is exchanged for the other. This switching of meanings, a "double entendre," is often the basis for humorous puns ("A sign in a Texas restaurant reads, 'Remember the a la mode" [Remember the Alamo] (Guilford, 1977, p. 39)). The word play condition of the current study explored words with two meanings and homophones, words that sound the same but are spelled differently and have different meanings (e.g., roll – role or hare – hair). Another common instance of a semantic transformation is connected with the use of objects. An object used in an unusual way that is counter to its typical recognized purpose, such as using a postcard for a bookmark rather than a short illustrated message, is an example of a semantic transformation. In the

creative construction condition, students needed to override the typical uses of the given recycled items, viewing them in new ways (e.g., an orange juice jug lid being seen as a wheel or base for a statue). The final category of transformation that Guilford expressly identified, *behavioral transformations*, involve misinterpretation of facial expressions, body language or spoken comments. The researcher predicted that this type of transformation would be unlikely to take place in the current study. The results of the data analysis supported this presumption. The next section of the paper is devoted to analysis of the literature on the status quo of the recognition of importance of creative transformations.

Recent Recognition of the Importance of Transformations

The idea of creative transformation is still popular. According to Davis et al. (2011), transformation is one of the most vital creative abilities. It involves a purposeful mental process aimed at changing an item, idea, concept, or process into a useful creative product. Michalko (2001) illustrated the concept of transformation with an example of transformation of old tires into shoes by people from Nairobi. They cleverly transformed old tires into very sturdy shoes and sandals. Nairobians noticed that the rubber composing the tires was very durable even in harsh weather and road conditions. Therefore they adapted the material to a new use and creatively changed the original object (tire) into another (shoes). This recognition of the possible new use of an item, a type of semantic transformation, was termed "latent potential" by Michalko (2001, p. 234).

These previously described ideas of Guilford, Davis and others, and Michalko on the importance of transformation in the creative process formed part of the theoretical

foundation of this study. Transformations were employed during both word play and use of recycled items for the three-dimensional constructions and were essential to the success of the products.

Word Play

Piirto (2004) discussed the characteristics of young creative writers who show extraordinary talent in writing, identifying sixteen traits. Among these important qualities were several related to word play: "unusual use of figures of speech – alliteration, personification – assonance… …Displaying a natural 'ear' for language… …Sense of humor… …A willingness to 'play' with words" (p. 228). Therefore, the word play exercises in this research project helped some students to develop the skills of talented writers.

Word play is an authentic skill used by many professionals. Certainly, poets make use of word play, but also song writers, advertisers, greeting card designers, cartoonists, those who devise product names, and even parents naming their children. In a well-known Indian movie "Seeta aur Geeta" (Bhatnagar, 1972) released in 1972, two twin sisters were named Seeta and Geeta, rhyming names. A chain of craft stores in the US has the memorable rhyming name of Hobby Lobby. A popcorn snack product uses assonance in its name, Fiddle-Faddle, along with the chocolate cookie bar, Kit-Kat.

Problem-Solving through Creative Constructions

There are two previous reports in the literature that are related to one of the two main activities highlighted in this investigation. One publication (Rule et al., 2011) described the creative products that teachers of the gifted attending a state conference on gifted education made during a workshop. They were each provided with an identical bag of recycled and craft items, given a theme (e.g., "cool space" or "under water"), given scissors, glue, markers, and thread, and asked to make an object or scene using all of the materials in the time limit of 40 minutes. Products were photographed and analyzed for creative strengths to serve as an example to teachers who might want to implement this activity in their classrooms to help students recognize creative traits of products.

Similar to the publication just mentioned, a journal article (Rule et al., in press) described the creative products made from a set of given materials by graduate students in a creativity class. The overall theme was economics, but individual students each chose a subtheme for their products. These two publications report problem-solving activities very similar to the spatial construction experimental condition in the current investigation.

Effect of Spatial and Temporal Distances on Creativity

Construal Level Theory

According to the Construal-Level theory of psychological distance (Trope & Liberman, 2010), people are more creative when they perceive a psychological distance between themselves and the stimulus. This psychological distance can take many forms: time, geographical space, social distance and probability of occurrence. According to the

theory, although these distances are different in nature, they have a similar effect on cognition – causing more abstract thinking. Abstract thinking produces high-level mental representations that facilitate creativity through better mental insight, better visual insight, and generation of more creative responses (Jia, Hirt & Karpen, 2009). This idea seems to counter the intuitive belief that familiarity enhances creative production, but recent research applying this theory to creativity (Jia, Hirt & Karpen, 2009; Liberman et al., 2012) has shown that reaching an abstract level of thought is more important to generating ideas.

Psychological Distances

One of the main ideas of Construal-Level theory is that people use more concrete, detailed, and contextualized mental representations of meaning for proximal events (close in time, space, social situation, or likelihood of occurrence), but use abstract, schematic, and decontextualized ideas for distant concepts for which they lack knowledge through experience (Trope & Liberman, 2010). Because distal events cannot be experienced, but must be mentally construed or imagined, the mind operates in an abstract state where more general categorization is facilitated, resulting in more creative production as possible members of these categories are found.

For example, the school topic of the human skeletal system can be experienced directly by students who feel their bones and examine how their joints work, making this a proximal subject for which they have concrete experiences and mental understandings. A student may think of the topic of bones as the painful experience of breaking a toe, an x-ray shown on a TV show, a pet with a chew toy, or a skeleton decoration from

Halloween – all concrete ideas coming from experience. In contrast, the school topic of fossil sea life is far removed from the present time and the less-familiar organisms (trilobites, crinoids, corals) are different from humans and pets, resulting in more abstract, general modes of description. A student will imagine that a trilobite eats some sort of food, but probably will not know what specifically and how it is consumed, therefore the student will use the more abstract category of "food."

Previous Work Related to Construal-Level Theory and Creativity

An early set of experiments by Förster, Friedman, and Liberman (2004) showed that distance in time positively affected creative production of college undergraduates. These students were asked to imagine what they would be doing the next year (distal condition) or the next day (proximal condition) before solving three problems. Students who imagined events in the distant future solved more problems than those who thought about the next day. The researchers concluded that the distant future time perspective elicited a mental processing shift toward more abstract thought, which supported insight during problem solving.

A study by Jia et al. (2009) examined the effect of spatial distance on creative problem solving. The participants of their study were college students in a psychology class. They tested whether student creative production was related to subjects' perception of whether the task originated from a geographically near group of researchers in their American city or one more distant, in Greece. They found that students who believed the task originated in Greece performed better on a problem-solving task and produced more creative responses. Because they later decided that the idea of "Greece" might have

introduced the extra variable of a "foreign" place rather than just a distant locality, they repeated the study using California instead of Greece and added a control group. The ensuing results were similar.

An investigation by Subbotsky, Hysted, and Jones (2010) examined distance on the dimension of hypotheticality (probability of events actually occurring) with early childhood subjects of ages 4 to 8 years. The results of the study showed that exposing children to films with magical content, rather than reality-based films, enhanced student performance on a creativity test taken following the film.

Another recent study by Liberman and others (2012) was conducted with first and third grade student participants. Students individually took a commercial creativity test, the Tel Aviv Creativity Test (Milgram & Milgram, 1976) after being "primed" by the researcher. Priming occurred by showing a series of slides on a laptop computer that started with an eraser and pencil on a desktop, then whole desk, classroom, school, neighborhood, and so on until zooming out to the Milky Way (the distal condition) or by beginning with the Milky Way and slowly zooming in to the eraser on a desktop (the proximal condition). Students evidenced greater fluency and originality on the creativity test when being primed with the distal condition, showing that creative performance of elementary school students was enhanced by the focus on distant stars before taking the test that promoted the use of more abstract mental processes.

Applying Construal Level Theory to the Current Study

The current study differs from previous work in this area in the following ways:

1. It incorporates *all four* of the types of psychological distances, temporal, spatial, social, and hypotheticality (probability) to the experiment, rather than just one or two.
2. The current study's population was middle school students of low socio-economic background, whereas two of the previous studies were conducted with adults, one with elementary first and third graders and the other study tested preschoolers.
3. Previous studies merely primed their subjects before administering creativity tests or problems to be solved. The current study embedded the concept of psychological proximity directly into the problem to be solved.
4. The previous studies were single experiments, but the current study has a repeated measures design.

This section discussed the effects of Construal Level Theory on cognition in which distal topics result in more abstract thinking, leading to generalized categories with more creative ideas filling those categories. Several studies supported the premise of Construal Level Theory with the researchers (e.g., Jia et al., 2009; Subbotsky, et al., 2010) finding that psychologically distal content facilitated creativity of participants. The current study differed from previous studies by incorporating distal and proximal content into lesson content rather than priming participants before they engaged in unrelated creative activities. Also, all four types of psychological distances were included in the current study.

Chapter Summary

Creativity is a complex and multidimensional concept that is part of 21st century skill sets. These sets include skills that are considered to be important, not only for education, but for students' future lives outside school. Unfortunately, in many of today's schools, creativity skills are not addressed properly, although they can be very helpful for students in all the domain areas of education. Another important notion discussed in this chapter was the fact that creativity can be learned and taught. There is, however, a difference between domain-general and domain- specific creativity. Research to date is inconclusive on whether domain-specific creativity skills are transferrable from one domain to another. This study attempted to address the question about transferability of creativity.

Creativity is a complex construct; therefore, it is vital to use multiple methods of assessment. An additional reason for using multiple methods of assessment is controlling for contextual factors, which may influence a student's level of creativity. One core and seminal idea of the creativity theory is the concept of creative transformation, which involves a purposeful mental process aimed at changing an item or idea into a useful, creative product. This study employed two types of transformation: word-play and creative constructions. The current research study also employed the Construal-Level theory of psychological distance which states that people are more creative when they perceive a psychological distance between themselves and the stimulus because this distance promotes abstract thought.

CHAPTER 3

METHODOLOGY

The purpose of this study was to provide evidence concerning whether creativity is domain-specific or transferable across domains and whether it is affected by the type of content (distal or proximal) being addressed. This investigation is a pretest-posttest two-experimental-group repeated measures with a counterbalanced design study.

This study explored two major areas of creativity – creative word play and creative spatial constructions – with academic content that was either distal or proximal to students integrated into the activities. This study examined the following research questions:

1. Can creative strengths be transferred from one domain to another?
2. Do students evidence more creativity when the applied academic content area is perceived as distant (distal) in time, space, probability and society from them as compared to close (proximal) in time, space, probability and society as claimed by previous studies?
3. What strategies do students use to integrate academic content with creative products?
4. How do students perceive their levels of creativity in the products they make?
5. How do students report their enjoyment of the creative process as the project progresses?

These five research questions in this research study were addressed through the collection of different types of both qualitative and quantitative data. The specific types of data collected and how this information was analyzed are discussed in this chapter.

Participants

Twenty-four sixth grade students (12 female, 12 male; 13 African-American, 4 Hispanic, 0 Asian-American, 0 Native American, and 7 Euro-American) with an age range of 11-12 years participated in the study. The students were divided into two treatment groups that were subdivided into a total of four groups of six students each (for small-group instruction purposes). This diverse group of students attended a one-month summer program at the University of Northern Iowa's Center for Urban Education (UNI-CUE). They represented a low-socio-economic population of students who received extra academic help to improve their school performance and chances of attending college.

This research project was approved by the University of Northern Iowa's Human Subjects Review Committee and the UNI-CUE director. All students and their parents or guardians gave written permission for their data to be included in this study.

Study Design

To test whether creative skills were transferable to another domain, a counterbalanced-design study was developed for twenty-four sixth grade students attending a summer skill-building program. "Counterbalancing is usually thought of as a method for controlling order effects in a repeated measures design" (The University of North Carolina, 2012). The study design was a two-experimental-treatment group design with counterbalancing. Therefore, two distinctly different treatments, both focused on

creativity, were developed to reflect the same integrated academic content. Each group served as the pretest-posttest control for the other group, as both groups completed both pretests on the first and last days of the project. The two treatments were focused on creative transformations – one verbal and the other spatial.

Half of the students participated in creative activities centered on word play for two of the four weeks while the other students practiced creative problem solving by constructing an item or scene from a given set of materials. After two weeks, the students switched conditions. Students received instruction on domain-related skills and general creativity each day. Additionally, student products were created to incorporate given academic content and were scored to determine creative production daily. Performance after the switch was examined to determine if creativity transferred across domains.

To gather evidence related to the possible effects of Construal Level Theory, the academic content integrated with each product was controlled so that every other product was related to a distal topic (e.g., the solar system) with the remaining products related to proximal topics (e.g., personal health). Student creativity shown in products was evaluated with a rubric to determine the possible effects of Construal Level Theory on each student's level of creativity evidenced in the product.

The verbal transformations incorporated creative word play including hink-pinks, spoonerisms, vowel changes, words with multiple meanings or double entendre, and homophones applied to student writings. New instruction on a specific word play skills were given daily except for the pretest and posttest activities. Table 1 shows the rationale for each component of the study.

Table 1.

Rationale for Major Components of the Study Design

Component	Rationale
Pretest posttest	Determine initial and final levels of creativity
Repeated measures	Tracing of growth in creativity skills; Differentiate student performance on distal and proximal topics
Counterbalancing with two groups and two conditions	Compare student creative performance for the same individuals in different conditions to determine domain transfer; To compare the different groups in the same conditions to determine if there are any order effects
Providing an academic content sheet each lesson	Controlling student background knowledge so that all students have the same opportunity to apply academic content
Small groups of 6 students	Effective observing of student behaviors and recording; Effective teaching and assisting of students
Alternating distal and proximal academic content	Determine if proximal or distal content affects creativity level
Student oral explanations of their work	Increase accuracy of scoring of creative and academic content in student work
Daily researcher's log of students' comments about work	Capturing student ideas to define student strategies and levels of creativity
Student self-rating of creativity	Determine if students' confidence levels in creativity increase, decrease, or remain unchanged
Student rating of enjoyment of creative process	Determine if students levels of enjoyment increase, decrease, or remain unchanged
Student rating of perception of distance of topic	Ensure that the researcher's perceptions of distal and proximal are similar to the students' and to provide data from possible covariance
Using a rubric with both general and domain-specific components	Determine what aspects of creativity are transferable across domains, if any
Expert rating of choice of medial topics for pretest-posttest	Ensure that the researcher chooses topics that are generally perceived as medial for pretest and posttest
Identical sets of materials for each student per day	Controlled variable
Same instructor for both conditions	Controlled variable
Same amount of time per lesson	Controlled variable

The spatial transformations involved creating a structure of given recycled and craft items that required the student to re-purpose the recycled items as parts of a scene or object related to the given content information, and to use the craft materials to complete the work. For example, if the given academic content was the solar system, a student might have used the given circular lid as a planet's orbit and have used some of the paper given to crumple into balls to make the planet Mars and its two moons. Other items may have been made into the asteroid belt that is near Mars to complete the scene. New instruction on creative thinking skills (e.g., elaboration, storytelling articulateness, unusual viewpoint, and emotional expressiveness) was given daily, along with tips for working with craft materials (e.g., how to make a cylinder or fringe from flat paper). Table 1 shows a summary of the rationale for different components of the study.

Every day, students received a sheet of academic content information appropriate to the subject areas of the sixth grade curriculum as shown in Table 2. This was briefly reviewed. Students also received brief instruction on a creative thinking skill appropriate to the experimental condition. See Table 3 for the sequence of these skills during the program. Then students integrated the given content with the creative thinking skills and given materials to make a product.

Table 2.

Academic Content Integrated into Lessons

Day	Hands-on Set #	Proximity	Topic	Vocabulary and Concepts
1	Set A Pretest	Close to Intermediate	Your Free Time	What you do in your free time
2	Set B Rhyming Objects	Proximal in Time and Space	Life Science-Local Ecology	Backyard Birds: robin, crow, cardinal, blue jay, sparrow, red wing blackbird
3	Set C Alliteration Objects	Distal in Probability	Social Studies: Geography	Global climate change: factory emissions, greenhouse effect, carbon dioxide, global warming, melting of ice at north and south poles, increase in natural disasters
4	Set D Homophone Objects	Proximal in Probability	Literacy: Ways I Communicate	Communication Formats I Know: Menu, Email, Speaking, Signs, Facial Expression, Letters, News Articles, Cell Phones
5	Set I Assonance Objects	Distal in space	Science: Earth and Space	Solar System: Sun, Saturn, Earth, Moon, comets, asteroids, meteorites
6	Set E Words with Multiple Meanings	Proximal in Space and Society	Science: Weather	Summer Weather: Warm temperatures, cumulous clouds, thunderstorm, cumulonimbus clouds, lightning, summer activities, summer clothing
7	Set G Vowel Change Word Families	Distal in Time, Space and Society	Social Studies: History	Revolutionary War: Stamp Act, Boston tea party, Fourth of July, Paul Revere, Declaration of Independence, Redcoats.
8	Set B Alliteration /Assonance Word Families	Proximal in Time and Space	Mathematics: Geometric Shapes	Geometric Shapes Around Me: Rectangles, circles, cylinders, cones, cubes, squares and rectangular prisms
9	Set A Long-Short Vowel Pairs	Distal In Time	Science: Fossils	Fossil sea organisms with hard parts preserved: Ancient sea life from millions of years ago, trilobites, crinoids, brachiopods, mold and cast

(table continues)

Day	Hands-on Set #	Proximity	Topic	Vocabulary and Concepts
9	Set A Rhyming Objects	Distal in Time and Space	Science: Life Science	Dinosaurs from Millions of Years Ago: Pteranodon, Lufengosaurus, Herrerasaurus, Plateosauraus, Tyrannosaurus, and Anchiceratops
10	Set B Alliteration Objects	Proximal in Probability	Health: Healthy Lifestyle	My Healthy Lifestyle: At the pool, traveling under your own power, healthy eating, getting enough sleep, hygiene, emotional health
11	Set C Homophone Objects	Distal in Probability	Literacy: Reading	Fairy tale, Myth, Science Fiction: Cinderella, Shoemaker and Elves, Neptune the Roman god, Raven the Trickster, Science Fiction
12	Set D Assonance Objects	Proximal in space	Science: Ecology	Doing My Part to Help the Earth: Recycle outgrown toys and clothes, pick up pet waste, turn off water when brushing teeth, turn off lights, use cloth grocery bags, recycle cardboard, paper, plastic, glass, don't litter
13	Set I Words with Multiple Meanings	Distal in Space and Society	Science: Natural Disasters	Japan's Earthquake, Tsunami, and Nuclear Disaster: Japan's islands, tsunami, earthquake, nuclear disaster, Japanese people, tea ceremony
14	Set E Vowel Change Families	Proximal in Time, Space, and Society	Community Rules/Laws	Staying Safe in my Community: Car safety, crosswalks, strange dogs, smoking, strangers, personal belongings, Internet safety
15	Set H Alliteration /Assonance Word Families	Distal in Time and Space	Math: Geometry	Geometry in Ancient Buildings: Cylinders, dome or hemisphere, pyramids, concentric circles, curving structures, circular structures
16	Set F Long-Short Vowel Pairs	Proximal in Time and Space	Human Body Systems	My Skeletal System: vertebrates, bones of the hand, bones of the arm, bones of the human body, broken bones, skeletons and holidays
17	Set A Posttest	Close to intermediate	Your Free Time	What do you do in your free time?

Table 3.

Sequence of Skills Taught to the Two Treatment Groups

	Word Play Condition Skills		Both Conditions	Spatial Condition Skills	
Day	Word Play Skill	Domain-Specific Creativity Skill	General Creativity Skill	Domain-Specific Creativity Skill	Construction Skill
1			Both pretests administered		
2	Set 1: Hink-pink: two rhyming words used to describe one item (e.g., red bed)	Insight Message of work is touching or inspiring	Elaboration The act of adding details to your ideas or product to improve it	Three-Dimensionality: having length, height, and depth	Making a cylinder or cone
3	Set 2: Alliteration. Same initial consonant sounds (e.g., mother, man)	Rhythm: Accent and cadence of syllables	Emotional Expressiveness through facial or body language or talking bubbles	Resistance to Premature Closure Using object in a non standard way	Making fringe
4	Set 3: Homophones. same sound different spelling different meanings (e.g., sun son)	Advanced Vocabulary. Multi-syllable examples or more difficult words	Originality - The ability to think of ideas no one else in the class has considered	Internal Visualization showing the interior or contents of an object	Wrapping items and gluing
5	Set 4: Assonance. Same vowel sounds	Other word Play Skills: Anagrams, palindromes, scrambled letters	Movement or action. by pose, position, motion lines or action words	Artistic Appeal – Particularly balanced, cute, beautiful, symmetrical work	Making a flange for attachment
6	Set 5: Words with multiple meanings. (e.g., pitcher – a jug and ball player)	Insight. Message of work is touching or inspiring	Effectiveness of Title. Highly descriptive or abstract title	Three-Dimensionality: having length, height, and depth	Making strips from a rectangular piece or spiral to make a long strip
7	Set 6: Simple vowel change (e.g., peg, pig, pog, pug; tap, tip, top)	Rhythm: Accent and cadence of syllables	Storytelling Articulateness. Telling or implying what happened before or after	Resistance to Premature Closure Using an object in a very non standard way	Folding paper to cut identical pieces

(table continues)

Day	Word Play Condition Skills		Both Conditions	Spatial Condition Skills	
	Word Play Skill	Domain-Specific Creativity Skill	General Creativity Skill	Domain-Specific Creativity Skill	Construction Skill
8	Set 7: Alliteration and assonance word families (Bag, band, bank)	Advanced Vocabulary. Multi-syllable difficult words	Sound. Interjection or sound in a talking bubble or through onomatopoeia	Internal Visualization showing the interior or contents	Punching holes and weaving chenille stick or wire to attach
9	Set 8: Short-long vowel change. (e.g., plum plume; tin tine; kit kite)	Other word Play Skills: Anagrams, palindromes	Fantasy. Imaginary characters, lands, or events	Artistic Appeal – Particularly beautiful, symmetrical work	Making a box or cube
10	Switch Conditions for second half of program or administer Posttest				

The word play products included: an advertising slogan with product name, title for movie/book, character description, song/rap, limerick, haiku, couplet, or other short poem, epitaph, fortune cookie wisdom, etc. The construction projects were assemblages of the contents of one of the individual identical sets of given recycled and craft materials. The products were photographed and later analyzed for creative traits and content addressed.

Lesson Procedures

The lessons for the two experimental groups were distinct and designed for minimal overlap of creative skills and approaches. The following lists tell the general sequence of lessons steps for each experimental group.

Experimental Treatment # 1: Creative Word Play

1. Word play skill and domain-specific creativity skill. Except for the pretest and posttest days, brief instruction in a word play skill such as homophones, words with multiple meanings, assonance, alliteration, or rhyming hink-pinks was given. All of the

topics were practiced with hands-on materials and word or definition cards that students arranged in a chart-like format or matched to corresponding objects. Figures 1-4 show example sets of objects and cards in a chart-like layouts or with riddles. Additionally, the researcher highlighted a domain specific skill at this time, such as adding rhythm, insight, or advanced vocabulary.

The researcher continuously observed students throughout the lesson and kept a handwritten log of their pertinent comments, questions and ideas. This information was entered into an electronic file or log at the conclusion of the lessons for that day. Table 3 shows the sequence of skills taught in the lessons.

2. General creativity skill. The researcher reviewed one general creativity skill that students applied to the project.

3. Academic content integration. Students were given a page of vocabulary and concepts about a 6^{th} grade content area, illustrated with clipart pictures. The vocabulary was specially selected according to the topic being distant or proximal. The topics were changed every day. Vocabulary and concepts were reviewed briefly, with input from students allowed. The researcher recorded a log and wrote down observations and students' verbalized ideas, as well as actions and reactions. The notes were typed into a file and analyzed afterwards.

4. Thought exercise. Students were led through a minute of imagining related to the given topic.

5. Productive thinking. Then students were given five minutes and a sheet of blank paper on which to write their ideas resulting from productive thinking. This list

contained words that were related to the given subject that might be used in writing. Students were told (1) to list as many related words as possible; (2) to put the words into categories and think of additional categories or add more words to existing categories; (3) to generate unusual word or off-the-wall ideas; (4) to add details to these ideas as they write.

6. Authoring writings that involve word play. Students were asked to apply the word play ideas and to create three of the following:

- advertising slogan with product name;
- title for movie/book and brief synopsis;
- character description;
- song or rap;
- limerick, haiku, couplet, or other short poem;
- epitaph (saying for tombstone);
- fortune cookie wisdom;
- newspaper headlines and summary;
- riddle or joke (knock-knock or elephant);
- greeting card wording;
- jump rope rhyme;
- hand clapping rhyme;

The students were encouraged to create at least three of the items previously described every lesson. They also were encouraged to each time chose items they haven't yet worked on.

Figure 1. Example Word Families of Same Initial Consonant and Vowel Sound

Figure 2. Example Layouts for Words with Multiple Meanings

Figure 3. Example Homophone Riddles. The clues are cotton container (boll bowl), golden root (karat carrot), whipped vegetable (beat beet), breezy nest (airy aerie), oatmeal code (cereal serial), and circular boat (arc ark). Clues on front; answers on back.

Figure 4. Example Assonance Riddles. The clues are bunny tinker (rabbit rattle), tawny fawn (gold doe), grass sheaf (hay bale), rock house (stone home), tan bovine (brown cow), and fantasy royalty (dream queen). Clues on front; answers on back.

7. Survey completion. Students completed a brief survey each day rating their enjoyment of the creative process in making the product and rating their perceived level of creativity (See Table 5). Students also completed a brief survey (Table 5) that revealed their perception of topics as distant or proximal to them. This was done to make sure the researcher interpreted their answers correctly when analyzing the data for relationships between creativity and Construal-Level Theory.

8. Identification of how academic content was present in the work. Students recorded the important vocabulary or concepts they planned to address in their work on the margin of the work or on another paper. These were collected and taken back to the university to analyze for creative traits and for use of content. Students also had the opportunity to share their work with classmates as time permitted.

Experimental Treatment # 2: Creative Constructions

1. Spatial construction skill and domain-specific creativity skill. Brief instruction was given on a skill helpful to spatial construction such as creating a cylinder from rolled paper, making fringe from flat paper, or making a cone. A domain-specific creativity skill also was taught such as internal visualization, or resistance to premature closure.

2. Domain general creativity skill. Brief instruction in a creative skill such as "elaboration" – adding details to the work; or "emotional expressiveness" – putting in facial expressions or having characters with talking bubbles was provided, as shown in Table 3. The researcher observed students throughout the lesson and kept a handwritten log of their comments, questions and ideas. After the conclusion of the day's lessons, this

information was entered into an electronic file and later analyzed in regards to research questions.

3. Academic content integration. Students were given a page of vocabulary and concepts about a 6th grade content area, illustrated with clipart pictures. The vocabulary was specially selected according to the topic being distant or proximal. The topics were changed every day. Vocabulary and concepts were reviewed briefly, with input from students allowed.

4. Thought exercise. Students were led through a minute of imagining related to the given topic.

5. Productive thinking. Then, students were given five minutes and a sheet of blank paper on which to write their ideas resulting from productive thinking. This list contained ideas or objects that were related to the given subject that might be used in the construction. Students were told (1) to list as many related objects or ideas as possible; (2) to put these ideas into categories and think of additional categories or add more ideas to existing categories; (3) to generate unusual or off-the-wall ideas; (4) to add details to these ideas as they make their constructions.

6. Making the constructions with recycled/craft items. Each student was given an identical set of approximately 12 items, white craft glue, scissors, paper punch, and permanent black markers to make the construction. The contents of the given sets are shown in Table 4. Students applied these recently-learned creativity skills and previously-learned ideas to the given sets of 12 recycled and craft items, incorporating as much of the content as possible.

7. Survey completion. Students completed a brief survey each day rating their enjoyment of the creative process in making the product and rating their perceived level of creativity (See Table 5). Students also completed a brief survey (Table 5) that revealed their perception of topics as distal or proximal to them. This was done to make sure the researcher interpreted their answers correctly when analyzing the data for relationships between creativity and Construal-Level Theory.

Table 4.

Contents of Sets of Given Materials for the Creative Construction

Set	Contents of Set	Category
A	Red spattered design cardboard frozen food tray, approximately 5 x 6 inches	Cardboard item
	Two painted plastic penguins molded together with a cylindrical hole	Unique, difficult to re-vision item
	Tie-dyed design wrapping paper approximately 5 x 7 inches	Foldable, sheet-like item
	Aluminum foil cupcake baking cup	
	Small yellow envelope 2 x 3.5 inches	
	Red plastic rectangular raisin box lid	Plastic shaped piece
	Circular sunburst design clear plastic bottom cut from juice carafe	
	Wooden clip style clothespin	Sticklike item
	Brown 6 inch chenille stick	Long, flexible item
	Red 6 Inch chenille stick	
	Piece of orange yarn 12 inches	
	Iridescent beads molded onto strand 6 inches	Shiny, lustrous item
B	Top of half-gallon juice carton	Cardboard item Unique, difficult to re-vision item
	Green cotton fabric with red polka dots, approximately	Foldable, sheet-like item
	Buff cardstock, approximately 5.5 x 4.25 inches	
	Green plaid wallpaper, approximately	
	Triangle of beige rubber shelf liner	
	White pleated circular cupcake wrapper	
	Green plastic lid for juice carafe, diameter 2.5 inches	Plastic shaped piece
	Green Popsicle stick	Sticklike item
	12 inch green chenille stick	Long, flexible item
	Green plastic flexible drinking straw	
	Yellow-green translucent faceted bead	Shiny, lustrous item
	Green metallic bead strand	
C	Bottom of half-gallon juice carton	Cardboard item
	White plastic swan cup	Unique, difficult to re-vision item
	Orange metallic, glittered wrapping paper piece, approximately 9 x 5 inches	Foldable, sheet-like item
	White paper doily, diameter 4 inches	
	Lavender velveteen upholstery fabric piece, approximately 4 x 6 inches	
	Green plastic lid for juice carafe, diameter 2.5 inches	Plastic shaped piece
	Lavender cylindrical hair roller	
	Black block of spongy foam, approximately 2.5 x 1.5 x 2 inches	
	Purple Popsicle stick	Sticklike item
	Green translucent plastic drink stirrer	
	Neon green chenille stick	Long, flexible item
	Large pale aqua facetted bead	Shiny, lustrous item

(table continues)

Set	Contents of Set	Category
D	Beige cardboard frozen food tray, approximately 5.7 x 7x 1 inches	Cardboard item
	Plastic crab figure	Unique, difficult to re-vision item
	Zebra striped wrapping paper piece, approximately 5 x 7 inches	Foldable, sheet-like item
	Beige-bluish-gold marbled wall paper, approximately 5 x 7 inches	
	Blue plastic can lid, 4 inches diameter	Plastic shaped piece
	Translucent blue small conical cup. 1.5 inches tall	
	Two blue jug caps, 1.5 inch diameters	
	Black plastic straw and drink stirrer	Sticklike item
	Light blue plastic spoon	
	Purple chenille stick	Long, flexible item
	Teal-blue pearly bead strand, approximately 8 inches	Shiny, lustrous item
E	Brown cardboard tomato tray, 1 x 5.5 x 6 inches	Cardboard item
	Pink plastic baby bootie	Unique, difficult to re-vision item
		Plastic shaped piece
	Sheer orange, glittered fabric, approximately 6 x 7 inches	Foldable, sheet-like item
	White paper cupcake liner	
	Aluminum foil cupcake liner	
	Two red fabric rose petals	
	Small yellow envelope 2 x 3.5 inches	
	Orange Popsicle stick	Sticklike item
	Neon orange chenille stick	Long, flexible item
	Light green lace 10 inches long	
	Gold metallic bead strand 6 inches long	Shiny, lustrous item
F	Central section of a juice from a cardboard pack approximately 4 inches high, 5 inches long and 5 inches wide	Cardboard item
	A plastic white swan	Unique, difficult to re-vision item
	Piece of yellow paper approximately 5 by 12 inches	Foldable, sheet-like item
	Strip of glittered blue foam approximately 1 by 12 inches	
	A blue milk bottle cap	
	Plastic white shot glass	Plastic shaped piece
	Plastic diamond shaped gem	
	Wooden dark blue ice-cream stick approximately 1/2 by 6 inches	Sticklike item
	Blue plastic knife approximately 1/2 by 8 inches	
	Brown chenille stick	Long, flexible item
	Grey chenille stick	
	Bead strand with bright blue flowers and beads - 4 flowers and 8 beads	Shiny, lustrous item

(table continues)

Set	Contents of Set	Category
G	The bottom of a cardboard box from orange/grapefruit juice. 1/2 inches high, with a bottom square 5 by 5 inches	Cardboard item
	A blue and black plastic lobster	Unique, difficult to re-vision item
	A piece of red fabric with white hearts approximately 6 by 7 inches	Foldable, sheet-like item
	A piece of red-wood colored paper approximately 7 by 8 inches	
	Green plastic lid for juice carafe, diameter 2.5 inches	Plastic shaped piece
	One green hair band diameter 1 inch	
	Two little fury puffs made of synthetic fabric. One green and one purple	
	A green plastic straw for beverages approximately 12 inches long	Sticklike item
	Wooden red ice-cream stick approximately 1/2 by 6 inches	
	Strip of glittered purple foam approximately 1 by 12 inches	Long, flexible item
	A thread with golden butterflies on it 6 butterflies	Shiny, lustrous item
H	White cardboard tray from precooked dinners. 1 inch high, 5 inches wide and 8 inches long	Cardboard item
	Plastic yellow dinosaur	Unique, difficult to re-vision item
		Plastic shaped piece
	Piece of gift wrapping paper: green with golden snowflake ornaments.	Foldable, sheet-like item
	A piece of black foamy material intended to protect electronics when it is stored in boxes. I by1.5 by 1 inches	
	A white spout from a detergent bottle, diameter 2.5 inches.	
	Strip of glittered pink foam approximately 1 by 12 inches	
	Strip of glittered yellow foam approximately 1 by 12 inches	
	Wooden green ice-cream stick approximately 1/2 by 6 inches	Sticklike item
	Blue chenille stick	Long, flexible item
	A thread with purple butterflies and beads - 6 of each	
	2 green marbles diameter 1/2 inches	Shiny, lustrous item
I	Central section of a juice from a cardboard pack approximately 4 inches high, 5 inches long and 5 inches wide	Cardboard item
	A piece of red fabric with hearts on it	Unique, difficult to re-vision item
	A sheet of yellowish wallpaper with little cherries painted on it approximately 4,5 inches wide by 8 inches long.	Foldable, sheet-like item
	A sheet of blue paper approximately 5 by 7 inches.	
	A piece of black foamy material intended to protect electronics when it is stored in boxes. I by1,5 by 1 inches	
	2 blue marbles diameter 1/2 inches	Plastic shaped piece
	A piece of cardboard box of a weird shape.	
	A pink chenille stick	Sticklike item
	Strip of glittered red foam approximately 1 by 12 inches	Long, flexible item
	A bead strand with three silver stars on it. One - big, one smaller and one smallest.	Shiny, lustrous item

Table 5.

Post-lesson Survey

Instructions: On a scale of 1 to 10, circle the number that indicates how much you enjoyed the creative process of making your product today.										
Didn't enjoy it at all	1	2	3	4	5	6	7	8	9	10	Enjoyed it very much
Please tell specifically what aspects were enjoyable or not enjoyable.										
Instructions: On a scale of 1 to 10, circle the number that indicates your level of creativity in the product you just made.										
Not creative	1	2	3	4	5	6	7	8	9	10	Very creative
Why did you rate your work in this way – Tell how it was creative or not creative.										
Please show on the scale below how you view the academic content information that was given today:										
Very **close in time** to me	1	2	3	4	5	6	7	8	9	10	Very **distant in time** from me
Very **close in distance** to me	1	2	3	4	5	6	7	8	9	10	Very **far in distance** from me
Very **likely to happen** or have happened	1	2	3	4	5	6	7	8	9	10	Very **unlikely to happen** or have happened
Very **similar to the interests and experiences** of my family and neighbors	1	2	3	4	5	6	7	8	9	10	**Not similar at all interests and experiences** of my family and neighbors

8. Identification of how academic content is present in the work. Students recorded the important vocabulary or concepts they addressed in their work. These notes were collected and analyzed for creative traits and for use of content. Students had the opportunity to share their work with classmates as time permitted.

Materials for the Spatial Construction Experimental Group

The pretest and posttest sets of materials were identical sets, and like the other sets, were designed to have certain types of items. Photographs of the items in each set are shown in Figures 5 through 14. Table 4, as mentioned previously, describes the contents of each set and the categories of the items.

Figure 5. Items in Set A

Figure 6. Items in Set B.

Figure 7. Items in Set C

Figure 8. Items in Set D

Figure 9. Items in Set E

Figure 10. Items in Set F

Figure 11. Items in Set G

Figure 12. Items in Set H

Figure 13. Items in Set I

Figure 14. Items in Set J

Instrumentation

Students were asked to complete a very brief survey each day to indicate their enjoyment of the creative process, their perceived level of creativity, and their perception of the proximity of the integrated academic content. The surveys are shown in Table 5. The rubric that was used to score the creative products is shown in Table 6. The record of the general and specific skills taught during the lessons is shown in Table 7.

Table 6.

Rubric for Scoring Creative Products

Creative Strength	Possible Examples	Not Present	Minimally Present	Two Instances	Three or more instances
		0	1	2	3
General Creativity					
Fluency	Number of words written or items used.				
Originality	Different idea than shown by peers				
Elaboration	Adding details to description or many instances; detailed construction				
Emotional Expressiveness	Emotional words; facial expressions, call-outs				
Humor	Bizarre, exaggerated, impossible, ironic situation				
Storytelling	Before-after or why explained; scene implied before or after				
Articulateness					
Movement/ Action	Action words; mechanical movement or motion lines				
Sound	Onomatopoeia or dialog; Speech bubbles, noise notations				
Sensory Impact (colorfulness)	Sensory details; sharpness, fuzziness				
Breaking Boundaries	Words in a shape or invented words; turning upside-down				
Fantasy	Imaginary characters, lands, events				
Effectiveness of Title	Highly descriptive or abstract title				
Parody	Parody of famous or well-known writing/artwork				
Abstract ideas	Generosity , understanding ; invisible item (odor) or ecology				
Domain Specific Traits Word Play					
Word play skill not taught	Anagrams, palindromes, spoonerisms				
Rhythm	Rap or other				
Wisdom/ Insight	Message of work is inspiring or touching				
Advanced Vocabulary	Multi-syllable examples or more difficult words				
Domain Specific Traits – Constructions					
Three-dimensionality	Instead of spreading the items into a flat object, the object has height				
Internal Visualization	Showing what is inside with a cutaway or transparent piece				
Artistic Appeal (Richness)	Particularly balance, symmetrical, cute or beautiful work				
Resistance to Premature Closure	Using an object in a very non standard way				

Table 7.

Record of General and Specific Skills Taught

			Word Play Condition		Spatial Construction Condition	
Days	Date	General Creative Skill	Specific Word Play Creative Skill	Word Play Skill Practice	Specific Construction Creative Skill	Specific Construction Practice Skill
1	June 4	Pretest	Pretest	Pretest	Pretest	Pretest
2, 9	June 5, 15	Effectiveness of Title	High Vocabulary	Rhyming Words/ Hink Pinks	Three-dimensionality	Making Cylinder / Cone
3, 10	June 6, 18	Elaboration	High Vocabulary	Alliteration Object Boxes	Three-dimensionality	Making Fringe
4, 11	June7, 19	Originality	Rhythm	Homophone Object Box	Resistance to Premature Closure	Wrapping an item
5, 12	June8, 20	Emotional Expressiveness	Rhythm	Assonance Object Boxes	Resistance to Premature Closure	Making a Flange
6, 13	June 11, 22	Storytelling Articulateness	Inspiring/ touching message	Words with Multiple Meanings	Internal Visualization	Reinforcement of Joints (Buttressing)
7, 14	June 13, 25	Movement or Action	Anagrams	Simple Vowel Change Families	Internal Visualization	Increase contact area when gluing
8, 15	June 14, 26	Sound	Inspiring/ Touching Message	Alliteration and Assonance Word families	Artistic Appeal (neatness, smooth curves, interesting details)	Cutting extra details on edges, etc for elaboration
9, 16	June 15, 27	Fantasy	Palindromes	Long-Short Vowel Pairs	Artistic Appeal (neatness, smooth curves, interesting details)	Ways to make moveable hinges
17	June 28	Posttest	Posttest	Posttest	Posttest	Posttest
18 Last day	June 29 Banquet Day	Replication of pencil on desk to galaxy study. 12 students end on galaxy; 12 end on pencil. No skills taught.				

Data Analysis

Each of the following research questions, which were presented earlier in this chapter and also in Chapter 1, was investigated through data collection and analysis. The types of data and the method of analysis are described in this section. A summary of how the data gathered relate to the research questions is presented in Table 8.

The first research question asked, "Can creative strengths be transferred from one domain to another?" This was determined by comparing student performance on making creative products in the new domain after the midpoint switching (because of counterbalancing) to performance immediately before switching.

The second research question, prompted by application of Construal Level Theory, was: "Do students evidence more creativity when the applied academic content area is perceived as distant (distal) in time, space, probability and society from them as compared to close (proximal) in time, space, probability and society as claimed by previous studies?" This was determined by comparing student scores on products that had proximal content to those created when the integrated content was distal. A third area of investigation, "What strategies do students use to integrate academic content with creative products?" was answered by observing students in action and by examining creative traits of products made under the different conditions: word play or spatial construction.

Finally, daily brief surveys were used to gather information to answer the last two questions: "How do students perceive their levels of creativity in the products they

make?" and, "How do students report their enjoyment of the creative process as the project progresses?"

Table 8.

Summary of Research Questions and Supporting Data

Research Question	Type of Data	Explanation
1. Can creative strengths be transferred from one domain to another?	Scores from the rubric for scoring creative products Scores from the rubric for scoring the productive thinking list	Domain transfer are indicated if the scores continued to grow rather than drop when the student switches conditions. Order effects may be noticed
2. Do students evidence more creativity when the applied academic content area is perceived as distant (distal) in time, space, probability and society from them as compared to close (proximal) in time, space, probability and society as claimed by previous studies?	Scores from the rubric for scoring creative products Scores from the rubric for scoring the productive thinking list Student ratings of their perceptions of distance and proximity of academic topics	Any differences in the means of the creativity scores for the distal versus proximal integrated academic content may indicate that Construal Level Theory is having an effect
3. What strategies do students use to integrate academic content with creative products?	Researcher's daily log Oral student explanations recorded by the researcher Observations of student products	Determine the most common strategies used in each domain
4. How do students perceive their levels of creativity in the products they make?	Student ratings of creativity of products	Determine the correlation of student perceptions with rubric scores of creativity, To determine how student perceptions of creativity change during the investigation
5. How do students report their enjoyment of the creative process as the project progresses?	Student ratings of enjoyment of process	Determine the correlation of student perceptions with rubric scores of creativity and students rating s of creativity To determine if students enjoyed the project in general or enjoyed one condition more than the other

CHAPTER 4

RESULTS AND DISCUSSION

Word Play Data Analysis and Discussion

During the creative word play lessons, students spent a few minutes initially brainstorming topic-related words that showed the word play on which the lesson focused. Then, they wrote one or more short pieces of writing such as a movie or book title, a fortune cookie saying, an advertising slogan, song or rap, or a character description. These two types of writings (the brainstormed words and the writing compositions) were entered separately into a Microsoft Excel spreadsheet for analysis.

Daily Wordplay Lesson Data Analysis

Fluency of words written. For the first analysis, the total number of words written both during the initial brainstorming session in which the students attempted to apply the lesson's word play techniques to the given topic and the number of words written in the writing pieces were tabulated. A mean of these counts for each student for each lesson in the proximal condition was calculated; similarly, the mean of the counts for each student for the distal condition was determined. A paired *t*-test that compared each individual student's mean in one condition to the other was performed. The results are shown in Table 9 on the line labeled "Fluency1."

The second fluency analysis (labeled "Fluency 2" in Table 9) involved only the writing piece and was conducted in the same manner as previously described. The third fluency analysis (labeled "Fluency 3" in Table 9) examined words *directly* related to the topic in both the brainstorming section and in the writing piece. Each topic-related word

was counted for each student for each lesson; duplicate words for that student for that lesson were not counted. The mean numbers of topic-related words per student for lessons in each condition were calculated. A paired *t*-test was used to compare the mean number of topic-related words per lesson for each student in one condition to that same student during the other condition. The results are shown in Table 9.

According to the results of fluency data analysis, students' writing pieces combined with brainstormed words included greater numbers of words when students studied proximal topics (Fluency 1: $p = 0.05$; $d = 0.27$; interpreted as a small effect size favoring the proximal condition). This result contradicts the premise of Construal Level Theory, which states that students display more creative traits when studying psychologically distal topics because they involve abstract mental activity. Fluency is one of the creative characteristics described by Torrance and colleagues (Torrance, Ball, & Safter, 1992). Writing fluency is based mainly on the student's active vocabulary related to the given topic. Students were more knowledgeable about proximal topics because these topics, by definition, were within their range of experience. Additionally, the researcher noted the reactions of students to distal and proximal topics. Generally, most students expressed greater approval and enjoyment of proximal topics compared to distal. Although a review of major concepts related to the current topic was conducted prior to students beginning work, students often indicated that they still did not feel confident in applying the topic to the wordplay task. They also complained with phrases like "Not again!" or "I don't know anything!" when offered a distal topic.

Table 9.

Results for the Daily Word Play Lessons Comparing Proximal to Distal Topics

Analysis	Mean (Standard Deviation) Proximal	Distal	Paired *t*-test *p*-value	Cohen's *d*	Significant Difference?
Fluency 1: Mean total number of words used per lesson in both brainstorming and writing pieces combined	57.9 (22.9)	52.6 (16.5)	0.05	0.27	Yes, favoring the proximal condition; small effect size
Fluency 2: Mean total number of words used per lesson in the writing pieces only	38. 4 (17.2)	36.4 (17.1)	0.25	-	No
Fluency 3: Mean total number of words related to the topic in both brainstorming and writing pieces combined	10.1 (3.7)	9.9 (3.1)	0.35	-	No
Originality 1: Mean writing piece word originality score per lesson calculated for words used 1-19 times	56.9 (26.6)	60.0 (28.0)	0.26	-	No
Originality 2: Mean writing piece word originality score per lesson calculated for words used 1-2 times	32.0 (7.1)	32.3 (18.0)	0.46	-	No
Elaboration: Mean number of adjective and adverbs in writing pieces per student per lesson	2.4 (1.3)	2.7 (1.7)	0.16	-	No
Emotional Expressiveness	0.5 (0.6)	0.8 (1.2)	0.05	0.33	Yes, favoring the distal condition; small effect size
Humor	0.2 (0.2)	0.2 (0.3)	0.27	-	No
Storytelling Articulateness	0.9 (1.0)	0.9 (1.3)	0.44	-	No
Movement or Action	0.7 (0.7)	0.4 (0.6)	0.05	0.43	Yes, favoring the proximal condition; small effect size
Sound	0.6 (1.0)	0.2 (0.2)	0.03	0.61	Yes, favoring the proximal condition; medium effect size
Sensory Impact	0.1 (0.2)	0.04 (0.1)	0.02	0.56	Yes, favoring the proximal condition; medium effect size
Breaking Boundaries	0.3 (0.4)	0.4 (0.4)	0.28	-	No
Fantasy	0.09 (0.2)	0.2 (0.4)	0.02	0.34	Yes, favoring the distal condition; small effect size
Effectiveness of Title	0.5 (0.4)	0.5 (0.5)	0.46	-	No
Parody	0.0 (0.1)	0.0 (0.1)	0.33	-	No
Abstract Ideas	0.4 (0.3)	0.5 (0.3)	0.12	-	No

(table continues)

Analysis	Mean (Standard Deviation)		Paired *t*-test	Cohen's	Significant
	Proximal	Distal	*p*-value	*d*	Difference?
Word play skill not taught	0.1 (0.1)	0.1 (0.1)	0.50	-	No
Rhythm	0.2 (0.2)	0.2 (0.2)	0.44	-	No
Wisdom/ Insight	0.3 (0.4)	0.3 (0.3)	0.43	-	No
Advanced Vocabulary	0.3 (0.4)	0.3 (0.3)	0.24	-	No

No significant differences between the distal and proximal conditions were found during the analysis of words used per lesson (Fluency 2 measure) in the writing pieces only. The analysis of words directly related to the topic in both the brainstorming and writing pieces combined also resulted in no significant difference between conditions.

Writing piece word originality analysis. The following procedure was used to examine the originality of words occurring in the writing pieces. All student writing pieces were divided into individual words. Each word was assigned a separate line on the spreadsheet with student code number and lesson number attached. Spreadsheet sorting functions were used to sort the words alphabetically to determine their frequency of use. Common words were deleted if they appeared 20 times or more in the compiled set of all student writing piece words used throughout the study. The list of frequently-used deleted words consisted of: a, ain't, am, an, and, are, aren't, as, at, be, been, because, being, bird, bones, but, by, can, cannot, can't, come, day, did, didn't, do, does, doesn't, doing, don't, Earth, for, from, get, go, goes, going, got, had, has, have, he, her, him, his, I, if, I'm, in, is, isn't, it, its, it's, knock, make, me, my, no, not, now, of, on, one, our, out, said, say, see, shape, she, so, square, that, that's, the, their, them, then, there, they, this, to, tree, us, was, we, went, were, what, what's, who, who's, will, with, won't, you, you'll, your,

you're. The rest of the words were assigned points according to the frequency of their usage by students as shown in Table 10. Examples of words used only once in the entire writing piece include: adventure, awesomeness, breeze, carnivore, century, collar, colorful, dehydrated, empires, fantastic, golden, inspiring, kazoo, octopus, Olympic, peering, performing, releasing, retriever, signature, swallowing, and whale.

Table 10.

Scoring Scheme for Word Originality in the Writing Pieces

Word Frequency	Points Awarded
11 to 19	1
6 to 10	2
4 to 5	3
3	4
2	5
1	6

Undeleted words were sorted by student number, lesson number, and by being associated with a distal (distant) or proximal (near) writing topic. The sum of points for each student for each day was calculated. The mean originality word score for each student over the course of all lesson days that were associated with a proximal topic was calculated. Similarly, the originality mean score for each student for all writings associated with distal writing topics was calculated. Later, the means of all students' scores for the conditions (distal or proximal) were calculated and compared through a paired *t*-test (pairing each student's score under one condition with that same student's score under the other condition).

Two scores were calculated for originality. The Originality 1 score (Line 4 of Table 9) was determined as explained previously for words used 1-19 times for each student for each lesson. Then, a mean for each student for each condition was calculated. The Originality 2 score (line 5 of Table 9) was calculated using only words found 1-2 times in all the wordplay lessons. Neither of these originality measures was affected by the theme of the lesson being proximal or distal. The mean student score for the proximal condition was only slightly different from the mean student score for the distal condition. The paired *t*-test showed no significant difference. In other words, the students' originality word scores were not affected by the writing theme being distant or close to the students' experiences. Individual student means were examined to see if the highest means occurred in one condition or another. Exactly half (12) of the students scored somewhat higher in the proximal condition and half scored somewhat higher in the distal condition. This finding affirms that there was no significant difference between conditions for originality of word choice.

In a second analysis, the researcher removed all the words which received a score of four or less (all words that appeared three or more times). This second analysis was an attempt to determine if the results would be consistent or if perhaps the cut-offs for point scoring were strongly affecting the results. The results ("Originality 2" Shown on line 5 of Table 9) supported the findings of the previous analysis. No statistically significant difference was found between the students' results in distant (distal) and proximal (close) conditions when only the most original words were analyzed. Again, exactly half of the students scored somewhat better in one condition than the other when individual; student

means were examined. Both of these analyses indicate that the proximal or distal nature of the writing topic did not affect student performance in choosing original words.

Elaboration and other creative traits in the daily lessons. Elaboration, measured by the mean number of adjectives and adverbs in writing pieces per student per lesson, was not affected differently by the two conditions (proximal and distal). The analysis of daily writing (Table 9, line 7) showed that students expressed emotions in their writing pieces in the distal condition more often (Elaboration: $p = 0.05$; $d = 0.33$; interpreted as a small effect size favoring the distal condition). Perhaps these results were stimulated by the nature of the distal topics rather than psychological distance. For example one of the topics was the disaster that happened in Japan in 2011 when a nuclear power plant was destroyed by the earthquake and tsunami. Another two topics were the Revolutionary War and climate-related disasters. It is possible that students responded to these topics more emotionally than to others because each event itself was empathy-provoking.

Humor and storytelling articulateness were not affected by the distal or proximal conditions. In fact, there were very few instances of humor in all the students' works over the period of the study. In contrast to what would be predicted by Construal Level Theory, students' writings included significantly more instances of movement, action, sound and sensory impact in the proximal condition (Movement: $p = 0.05$; $d = 0.43$; interpreted as a small effect size favoring the proximal condition; Sound: $p = 0.03$; $d = 0.61$; interpreted as a medium effect size favoring the proximal condition; Sensory Impact: $p = 0.02$; $d = 0.56$; interpreted as a medium effect size favoring the proximal condition). This result may have been caused by a higher level of psychological comfort

of students when working with a proximal topic. It is possible that students felt more relaxed because the topic seemed familiar and less intimidating than a distal one.

Abstract ideas, parody, and effectiveness of title were not affected by the psychological distance of the topics. These creative traits appeared infrequently in students' writings. Construal Level theory would have predicted more abstract ideas for the distal condition. This was not observed.

Students incorporated elements of fantasy such as fairies, gnomes, and trolls, in their writing pieces when working with distal topics more often than with proximal (Fantasy: $p = 0.02$; $d = 0.34$; interpreted as a small effect size favoring the distal condition). This result supports the Construal Level Theory premise that a topic distal in probability causes students to be more creative. Fantasy may promote creativity because it requires free use of the imagination.

Comparison of Group A and Group B on the wordplay lessons. Table 11 presents the analysis results for the daily word play lessons comparing Group A to Group B. Group A studied and practiced creative wordplay during the first two weeks, while Group B participated in wordplay lessons the last two weeks after having done construction lessons. Overall, the data in the table support the contention that Group B was able to transfer creative skills from previous construction work to the wordplay writing tasks.

The performance of Group B (after completing the construction work) during the wordplay lessons was superior to the performance of Group A. Students from Group B incorporated more words into the creative writing activity alone as well as combined with the brainstorming exercise. Group B also performed better in all measures of fluency,

using a greater total number of words in both writing combined with brainstorming (Fluency 1: $p = 0.007$; $d = 1.08$; interpreted as a large effect size favoring Group B), in the writing pieces alone (Fluency 2: $p = 0.05$; $d = 0.68$; interpreted as a medium effect size favoring Group B), and in words directly related to the topic (Fluency 3: $p = 0.05$; $d = 0.71$; interpreted as a medium effect size favoring Group B).

Table 11.

Analysis Results for the Daily Word Play Lessons Comparing Group A to Group B. Group A participated in wordplay lessons the first two weeks; Group B participated in wordplay lessons the last two weeks after having done construction lessons.

Analysis	Mean (Standard Deviation)		*t*-test *p*-value	Cohen's *d*	Significant Difference?
	Group A	Group B			
Fluency 1: Mean total number of words used per lesson in both brainstorming and writing pieces combined	46.9 (10.4)	63.9 (19.8)	0.007	1.08	Yes, favoring Group B; large effect size
Fluency 2: Mean total number of words used per lesson in the writing pieces only	32.8 (13.1)	43.6 (18.4)	0.05	0.68	Yes, favoring Group B; medium effect size
Fluency 3: Mean total number of words related to the topic in both brainstorming and writing pieces combined	8.9 (2.7)	11.0 (3.2)	0.05	0.71	Yes, favoring Group B; medium effect size
Originality 1: Mean writing piece word originality score per lesson calculated for words used 1-19 times	45.2 (11.1)	68.5 (33.0)	0.02	0.96	Yes, favoring Group B; large effect size
Originality 2: Mean writing piece word originality score per lesson calculated for words used 1-2 times	27.6 (5.9)	37.7 (18.9)	0.05	0.72	Yes, favoring Group B; medium effect size
Elaboration: Mean number of Adjective and Adverbs in Writing pieces per student per lesson	1.7 (0.9)	3.3(1.5)	0.003	1.25	Yes, favoring Group B; very large effect size
Emotional Expressiveness	0.4 (0.4)	1.0 (1.1)	0.05	0.69	Yes, favoring Group B; medium effect size

(table continues)

Analysis	Mean (Standard Deviation) Group A	Group B	Paired *t*-test *p*-value	Cohen's *d*	Significant Difference?
Humor	0.2 (0.2)	0.2 (0.2)	0.47	-	No
Storytelling Articulateness	0.7 (0.8)	1.1 (1.0)	0.14	-	No
Movement or Action	0.2 (0.2)	1.0 (0.5)	0.0001	1.92	Yes, favoring Group B; very large effect size
Sound	0.6 (0.7)	0.2 (0.2)	0.02	0.95	Yes, favoring Group A; with a large effect size
Sensory Impact	0.1 (0.1)	0.1 (0.1)	0.27	-	No
Breaking Boundaries	0.1 (0.1)	0.6 (0.4)	0.0007	1.64	Yes, favoring Group B very large effect size
Fantasy	0.03 (0.1)	0.3 (0.4)	0.02	0.91	Yes, favoring Group B; large effect size
Effectiveness of Title	0.6 (05)	0.5 (0.2)	0.36	-	No
Parody	0.01 (0.04)	0.02 (0.07)	0.33	-	No
Abstract Ideas	0.4 (0.3)	0.4 (0.2)	0.39	-	No
Word play skill not taught	0.1 (0.1)	0.0 (0.1)	0.22	-	No
Rhythm	0.2 (0.2)	0.2 (0.1)	0.23	-	No
Wisdom/ Insight	0.1 (0.1)	0.5 (0.3)	0.0002	1.74	Yes, favoring Group B; very large effect size
Advanced Vocabulary	0.2 (0.1)	1.0 (0.4)	0.01	1.10	Yes, favoring Group B; large effect size

Despite the fact that Group B was working on creative construction first and had no direct preparation in creative wordplay, they outperformed Group A in both measures of originality (Originality 1: $p = 0.02$; $d = 0.96$; interpreted as a large effect size favoring Group B; and Originality 2: $p = 0.05$; $d = 0.72$; interpreted as a medium effect size favoring Group B). Pretest data, discussed in a following section, indicated there were very few (three: Movement, Sound, and Wordplay Skill not yet taught) initial significant differences between the two groups.

Concerning elaboration in writing (shown in Table 11), students from Group B used more adjectives and adverbs in their writing pieces in comparison to the other group (Elaboration: $p = 0.003$; $d = 1.25$; interpreted as a very large effect size favoring Group

B). The number of instances of emotional expressiveness in the writing pieces of Group B exceeded those of the other group (Emotional Expressiveness: $p = 0.05$; $d = 0.69$; interpreted as a medium effect size favoring Group B). Similarly, Group B students, who received preparation in creative construction first, used more action words than students who studied wordplay first (Movement: $p = 0.0001$; $d = 1.92$; interpreted as a very large effect size favoring Group B). Additionally, the students from Group B more often used fantasy and broke boundaries in their creative writing (Fantasy: $p = 0.02$; $d = 0.91$; interpreted as a large effect size favoring Group B; and Breaking Boundaries: $p = 0.0007$; $d = 1.64$; interpreted as a very large effect size favoring Group B).

Several creative trait areas showed no significant differences between groups. The number of instances of humor, parody and sensory impact, effectiveness of title, and abstract ideas was too small for a conclusion to be made regarding the use of these creative traits in writing pieces of both groups. The only area in which Group A outperformed Group B was incorporation of sound or onomatopoeia in creative writing (Sound: $p = 0.02$; $d = 0.95$; interpreted as a large effect size favoring Group A). This was a low incidence trait and may have been affected by differences between individual students.

The significant differences favoring Group B occurred with very large, large or medium effect sizes, indicating the great impact of these results. Because the performance of Group B significantly exceeded the performance of the Group A in daily creative writing in regards to 11 creative traits out of 16, one might assume that creative skills learned during the construction lessons were successfully transferred and

implemented in the other condition (the wordplay condition). A recent article in *Educational Leadership* by Root-Bernstein and Root-Bernstein (2013) described the importance of arts and crafts integration into the elementary curriculum to support scientific habits of thought and action such as practicing, persevering, and trial and error problem solving. Crafts allow development of visual thinking, pattern or shape recognition and formation, along with manipulative ability. Students who first practiced creative construction in the current study may have attuned themselves to noticing and using wordplay patterns and language patterns, thereby outperforming Group A members who did not yet have the craft experience.

Analysis of Pretest, Midterm, and Posttest Wordplay Scores

Wordplay pretest. Table 12 compares the performance of Group A and Group B on the pretest, midterm lesson, and posttest. This table is for comparing the two student groups rather than comparing the early, middle and late performance because the pretest and posttest topics were proximal and the midterm topics were distal. In all but two pretest areas, there was no significant difference between the two groups on the pretest. These two areas were (1) movement or action and (2) sound. Student writings were scored for movement or action each time a student used a specific action word like run, jump, spin, or dive (Movement: $p = 0.003$; $d = 1.31$; interpreted as a very large effect size favoring Group B). Duplicates of the same action word or a derivative in the same lesson were not counted. The students' writings were analyzed for so many different variables, that it is likely that there would be a couple of areas with some significant difference between the groups. Sound was scored for each time a student had a speaking quotation

or used onomatopoeia. The number of instances scored for sound was low in both groups; therefore, the results were determined by the performance of just a couple of individuals who were strong in these two areas rather than the whole group (Sound: $p = 0.04$; $d = 0.78$; interpreted as a medium effect size favoring Group B). Overall, the groups performed very similarly on the pretest with no significant differences in 15 of the 17 areas measured.

Wordplay midterm. Group A received wordplay instruction for the first two weeks of the unit; therefore, it was expected that they would outperform Group B on the midterm lessons, especially in areas specific to the wordplay such as word fluency, word originality, and use of adjectives, adverbs in elaboration, and emotional expression through word choice and punctuation (particularly exclamation points). Significantly higher performance of Group A was observed for word fluency (Table 12, line 2) in the writing pieces (Fluency 2: $p = 0.04$; $d = 0.83$; interpreted as a large effect size favoring Group A). Similarly, Group A students were observed to use more emotional expression at the time of the midterm lessons (Emotional Expression: $p = 0.05$; $d = 0.70$; interpreted as a medium effect size favoring Group A).

Table 12.

Comparison of Performance in Pretest, Midterm, and Posttest Scores for Wordplay

Measure	Time	Group A (initial wordplay) Mean Score	Group B (initial construction) Mean Score	*p* value from *t*-test	Cohen's *d*	Significant Difference?
Fluency 1: Mean total number of words in both brainstorming and writing pieces combined	Pretest	46.3 (22.2)	40.3 (20.7)	0.25	-	No
	Midterm	52.7 (33.0)	33.1 (12.6)	0.04	0.79	Yes, favoring Group A; large effect size
	Posttest	47.4 (15.2)	55.6 (26.0)	0.19	-	No
Fluency 2: Mean total number of words in the writing piece	Pretest	23.4 (13.2)	20.3 (15.8)	0.30	-	No
	Midterm	42.1 (28.6)	24.0 (10.6)	0.04	0.83	Yes, favoring Group A; large effect size
	Posttest	29.4 (13.3)	38.6 (16.5)	0.08	-	No
Fluency 3: Mean total number of words related to the topic in both brainstorming and writing pieces combined	Pretest	9.6 (4.3)	8.7 (5.7)	0.33	-	No
	Midterm	5.5 (4.0)	6.5 (2.5)	0.39	-	No
	Posttest	11.5 (5.3)	11.5 (5.4)	0.49	-	No
Originality 1: Mean writing piece word originality score calculated for words used 1-19 times	Pretest	3.9 (0.9)	3.1 (2.0)	0.19	-	No
	Midterm	3.0 (1.3)	3.2 (1.0)	0.36	-	No
	Posttest	4.0 (0.5)	3.4 (1.2)	0.09	-	No
Originality 2: Mean writing piece word originality score calculated for words used 1-2 times	Pretest	5.3 (1.7)	4.4 (2.7)	0.17	-	No
	Midterm	5.2 (1.7)	5.0 (1.6)	0.36	-	No
	Posttest	5.7 (0.3)	5.2 (1.7)	0.16	-	No
Elaboration: Mean number of adjectives and adverbs per student	Pretest	1.4 (1.2)	1.1 (1.2)	0.25	-	No
	Midterm	2.2 (2.5)	1.25 (1.5)	0.15	-	No
	Posttest	2.3 (1.6)	3.3 (2.8)	0.17	-	No
Emotional Expressiveness	Pretest	0.2 (0.4)	0.3 (0.5)	0.18	-	No
	Midterm	0.5 (0.7)	0.1 (0.3)	0.05	0.70	Yes, favoring Group A; medium effect size
	Posttest	0.5 (1.2)	0.5 (0.7)	0.45	-	No

(table continues)

Measure	Time	Group A (initial wordplay) Mean Score	Group B (initial construction) Mean Score	*p* value from *t*-test	Cohen's *d*	Significant Difference?
Humor	Pretest	0.2 (0.4)	0.1 (0.3)	0.28	-	No
	Midterm	0.2 (0.4)	0.3 (0.6)	0.38	-	No
	Posttest	0.3 (0.5)	0.1 (0.3)	0.17	-	No
Storytelling Articulateness	Pretest	0.6 (1.0)	0.6 (1.1)	0.5	-	No
	Midterm	0.0 (0.0)	0.3 (1.0)	0.18	-	No
	Posttest	0.7 (1.8)	0.6 (1.6)	0.48	-	No
Movement or Action	Pretest	0.6 (1.0)	2.0 (1.2)	0.003	1.31	Yes, favoring Group B; very large effect size
	Midterm	0.0 (0.0)	0.1 (0.3)	0.18	-	No
	Posttest	1.7 (1.3)	1.3 (1.0)	0.20	-	No
Sound	Pretest	0.0 (0.0)	0.3 (0.5)	0.04	0.78	Yes, favoring Group B; medium effect size
	Midterm	0.1 (0.3)	0.0 (0.0)	0.17	-	No
	Posttest	0.1 (0.3)	0.0 (0.0)	0.18	-	No
Sensory Impact	Pretest	0.1 (0.3)	0.0 (0.0)	0.2	-	No
	Midterm	0.0 (0.0)	0.0 (0.0)	-	-	No instances in both groups
	Posttest	0.0 (0.0)	0.0 (0.0)	-	-	No instances in both groups
Breaking Boundaries	Pretest	0.1 (0.3)	0.2 (0.4)	0.3	-	No
	Midterm	0.1 (0.3)	0.3 (0.5)	0.17	-	No
	Posttest	0.3 (0.5)	0.6 (0.9)	0.17	-	No
Fantasy	Pretest	0.0 (0.0)	0.0 (0.0)	-	-	No instances in both groups
	Midterm	0.0 (0.0)	0.0 (0.0)	-	-	No instances in both groups
	Posttest	0.0 (0.0)	0.3 (0.7)	0.10	-	No
Effectiveness of Title	Pretest	0.1 (0.3)	0.0 (0.0)	0.17	-	No
	Midterm	0.6 (0.7)	0.2 (0.4)	0.06	-	No
	Posttest	0.4 (1.0)	0.7 (0.8)	0.21	-	No
Parody	Pretest	0.0 (0.0)	0.0 (0.0)	-	-	No instances in both groups
	Midterm	0.0 (0.0)	0.0 (0.0)	-	-	No instances in both groups
	Posttest	0.0 (0.0)	0.0 (0.0)	-	-	No instances in both groups

(table continues)

Measure	Time	Group A (initial wordplay lessons) Mean Score	Group B (initial construction lessons) Mean Score	*p* value from *t*-test	Cohen's *d*	Significant Difference?
Abstract Ideas	Pretest	0.0 (0.0)	0.0 (0.0)	-	-	No instances in both groups
	Midterm	0.5 (0.8)	0.4 (0.7)	0.35	-	No
	Posttest	0.1 (0.3)	0.1 (0.3)	0.48	-	No
Word play skill not taught	Pretest	1.3 (0.8)	0.2 (1.0)	0.0004	1.61	Yes, favoring Group A; very large effect size
	Midterm	0.0 (0.0)	0.0 (0.0)	-	-	No instances in both groups
	Posttest	0.2 (0.4)	0.0 (0.0)	0.08	-	No
Rhythm	Pretest	0.0 (0.0)	0.2 (0.4)	0.08	-	No
	Midterm	0.3 (1.0)	0.3 (1.0)	1.0	-	No
	Posttest	0.3 (1.0)	0.2 (0.4)	0.2	-	No
Wisdom/ Insight	Pretest	0.0 (0.0)	0.2 (0.4)	0.08	-	No
	Midterm	0.2 (0.3)	0.3 (1.0)	0.2	-	No
	Posttest	0.3 (1.0)	1.0 (1.0)	0.01	0.99	Yes, favoring Group B; large effect size
Advanced Vocabulary	Pretest	0.0 (0.0)	0.1 (0.3)	0.08	-	No
	Midterm	0.1 (0.3)	0.0 (0.0)	0.2	-	No
	Posttest	1.0 (1.0)	0.3 (1.0)	0.2	-	No

Wordplay midterm lessons. On the midterm lessons, the researcher expected that there would be greater differences between the two groups on the wordplay measures; this was only minimally manifested in the two areas noted previously, although those two instances had a medium and a large effect size. The sample population for this study was an urban low socio-economic group of students who needed to improve their mathematics and language skills. The researcher observed their reluctant and resistant

reactions to wordplay lessons that pushed students to expand effort in areas in which they struggled.

One of the students remarked during a wordplay lesson, "It is all so hard! I don't know what rhymes with Japan." The researcher encouraged the student to keep trying and suggested to substitute a different word for "Japan" for which the student could find a rhyme such as "place" or "land." Another student sighed and said, "I am so bad at this. Your poems and film [title]s are so good and [student name]'s poems and [student name]'s poems. I can never do as good as you do…" The researcher reminded the student about her previous successful wordplay creations. Then the researcher helped the student work on her poem by asking leading questions.

Another student comment was, "Everyone is reading so much better and faster than me…" The researcher said that the student should not give up, assuring him that with continued effort, he would soon be reading at the same level as peers. One other student noted, pointing to the information page, "You have such hard words here…" The researcher explained that the more a student reads the better his or her reading skills become and that reading new words will help advance reading and writing skills. These student quotations show that even though students had two weeks of instruction in creative wordplay, progress was limited, resulting in fewer than the expected differences between the Group A who had engaged in wordplay and Group B who had focused on construction.

Wordplay posttest results. Posttest results indicated no significant differences between the two groups. Both groups had completed both treatments and no significant difference was expected by the researcher.

Construction Data Analysis and Discussion

Daily Construction Work

Comparison of proximal and distal conditions. Table 13 presents the results of comparing proximal to distal topics of scored student work during the construction lessons. Most areas did not show differences between the two conditions. Construal Level Theory predicted that students would show more creativity for the distal topics. This did not occur in the daily construction work. In fact, there were five areas in which the proximal condition was favored. Daily construction work results indicate that when students were more familiar with the topic (i.e., the topic was proximal), they had more confidence to break boundaries (Breaking Boundaries: $p = 0.01$; $d = 0.69$; interpreted as a medium effect size favoring the proximal condition), try new approaches (Resistance to Premature Closure: $p = 0.004$; $d = 0.67$; interpreted as a medium effect size favoring the proximal condition) and be more detailed in their work (Elaboration: $p = 0.05$; $d = 0.51$; interpreted as a medium effect size favoring the proximal condition). Students created more beautiful, artistically appealing work (Artistic Appeal: $p = 0.01$; $d = 0.62$; interpreted as a medium effect size favoring the proximal condition) and incorporated more sensory components (Sensory Impact: $p = 0.02$; $d = 0.72$; interpreted as a medium effect size favoring the proximal condition) when the topic was near to their experience (proximal).

Table 13.

Results for Daily Construction Lessons Comparing Proximal to Distal Topics

Analysis	Mean (Standard Deviation)		*t*-test *p*-value	Cohen's *d*	Significant Difference?
	Proximal	Distal			
Fluency: Amount of items used	18.7 (5.1)	16.9 (4.6)	0.07	-	No
Originality	2.4 (1.04)	2.2 (0.9)	0.29	-	No
Elaboration	3.6 (0.8)	3.2 (0.7)	0.05	0.51	Yes, favoring proximal condition; medium effect size
Emotion in title	0.2 (0.3)	0.2 (0.2)	0.28	-	No
Non-Title Emotional Expressiveness	0.5 (0.5)	0.4 (0.5)	0.27	-	No
Humor	0.0 (0.0)	0.01 (0.1)	0.16	-	No
Storytelling Articulateness	1.7 (0.6)	1.7 (0.6)	0.46	-	No
Movement or Action	0.9 (0.5)	0.8 (0.4)	0.21	-	No
Sound, talk or exclamation	0.1 (0.2)	0.2 (0.3)	0.14	-	No
Sensory Impact	0.5 (0.5)	0.2 (0.3)	0.02	0.72	Yes, favoring proximal condition; medium effect size
Breaking Boundaries	1.7 (0.8)	1.2 (0.7)	0.01	0.69	Yes favoring proximal condition; medium effect size
Fantasy	0.2 (0.4)	0.3 (0.2)	0.07	-	No
Parody	0.0 (0.1)	0.1 (0.2)	0.07	-	No
Abstract ideas in title	0.2 (0.3)	0.2 (0.3)	0.32	-	No
Wordplay in title	0.1 (0.1)	0.1 (0.2)	0.12	-	No
Effectiveness of title	2.1 (0.5)	2.0 (0.6)	0.10	-	No
Construction skills shown	2.1 (0.8)	2.0 (0.9)	0.18	-	No
Artistic appeal, beauty	3.1 (1.0)	2.5 (0.8)	0.01	0.62	Yes, favoring proximal condition; medium effect size
Resistance to premature closure	0.8 (0.4)	0.5 (0.2)	0.004	0.67	Yes, favoring proximal condition; medium effect size
Internal Visualization	0.7 (0.5)	0.6 (0.4)	0.10	-	No
Three-dimensionality	3.0 (0.8)	2.7 (1.0)	0.06	-	No

Comparison of Group A and Group B. Table 14 shows the results of comparing Group A to Group B during the daily construction lessons. Group B completed the construction lessons during the first two weeks of the teaching unit, while Group A first had two weeks of wordplay work and then engaged in construction work. Therefore, if

creativity skills can be transferred, they should appear as better performance of Group A during the construction work. There were two construction areas with significant differences favoring Group A: (1) artistic appeal or beauty of the work (Artistic Appeal: $p = 0.005$; $d = 1.15$; interpreted as a large effect size favoring Group A), and (2) movement or action (Movement: $p = 0.001$; $d = 1.38$; interpreted as a very large effect size favoring Group A). Artistic appeal was considered to be domain-specific to construction and was not addressed during the wordplay lessons; therefore, it could not have been transferred. However, during the first two weeks, Group A members, who were engaged in wordplay lessons, were able to see the products made by Group B students who were engaged in construction. Often, particularly appealing construction work or work that had mechanically moving parts was pointed out and noticed by Group A members. Group A students may have mentally noted these attributes and tried to incorporate them in their construction work. The two areas in which Group B outperformed Group A were areas specific to construction: (1) internal visualization (Internal Visualization: $p = 0.003$; $d = 1.23$; interpreted as a very large effect size favoring Group B) and (2) construction skills (Construction Skills: $p = 0.05$; $d = 0.69$; interpreted as a medium effect size favoring Group B). Therefore, these skills would not have been transferred. Perhaps students felt more motivation and enthusiasm during the first two weeks because of novelty, and that is why Group B performed better in these areas.

Table 14.

Results for Daily Construction Lessons Comparing Group A to Group B

Analysis	Mean (Standard Deviation)		*t*-test *p*-value	Cohen's *d*	Significant Difference?
	Group A	Group B			
Fluency: Amount of items used	18.2 (4.3)	17.3 (1.0)	0.29	-	No
Originality	2.2 (0.7)	2.2 (0.6)	0.5	-	No
Elaboration	3.5 (0.2)	3.2 (0.6)	0.15	-	No
Emotion in title	0.1 (0.2)	0.2 (0.2)	0.06	-	No
Non-Title Emotional Expressiveness	0.5 (0.4)	0.5 (0.3)	0.12	-	No
Humor	0.0 (0.0)	0.0 (0.0)	0.17	-	No (very few instances)
Storytelling Articulateness	1.8 (0.4)	1.7 (0.4)	0.2	-	No
Movement or Action	1.1 (0.3)	0.7 (0.2)	0.001	1.38	Yes, favoring Group A; very large effect size
Sound, talk or exclamation	0.1 (0.2)	0.2 (0.2)	0.38	-	No
Sensory Impact	0.4 (0.2)	0.3 (0.2)	0.23	-	No
Breaking Boundaries	1.6 (0.4)	1.4 (0.7)	0.2	-	No
Fantasy	0.3 (0.3)	0.2 (0.2)	0.12	-	No
Parody	0.0 (0.0)	0.1 (0.1)	0.09	-	No (very few instances)
Abstract ideas in title	0.2 (0.2)	0.3 (0.2)	0.17	-	No
Wordplay in title	0.1 (0.1)	0.1 (0.1)	0.5	-	No
Effectiveness of title	1.9 (0.5)	2.2 (0.4)	0.08	-	No
Construction skills shown	1.8 (0.6)	2.3 (0.7)	0.05	0.69	Yes, favoring Group B; medium effect size
Artistic appeal, beauty	3.1 (0.7)	2.5 (0.5)	0.005	1.15	Yes, favoring Group A; large effect size
Resistance to premature closure	1.0 (0.3)	1.0 (0.2)	0.12	-	No
Internal Visualization	0.5 (0.3)	0.9 (0.3)	0.003	1.23	Yes, favoring Group B; very large effect size
Three-dimensionality	3.1 (1.0)	2.6 (1.0)	0.07	-	No

Pretest, midterm and posttest results for construction. Table 15 presents the results of comparing Group A to Group B at the beginning, middle and end of the study. This table is for comparing the two student groups rather than comparing the early, middle and late performance because although all three assessments used the exact same set of

construction materials, the pretest and posttest topics were proximal and the midterm topics were distal.

On the pretest, only one measure out of 21 showed a significant difference between Group A and Group B. That measure was the effectiveness of title (Effectiveness of Title: $p = 0.03$; $d = 0.84$; interpreted as a large effect size favoring Group B). This occurred because the researcher forgot to tell Group A to title their work on the first day. This was a onetime error and all students were asked to title their work during each subsequent trial. This finding should be ignored because it artificially makes Group A's performance appear poorer. Therefore, the data indicate that there was no initial difference between the groups regarding construction skills.

Group A focused on the wordplay during the first two weeks while Group B engaged in construction lessons. The researcher, therefore, expected Group B students to perform better in construction on the midterm work because they had focused on that activity the previous two weeks. Indeed, the findings supported this premise. There were 13 significant differences found in the 21 measures during the midterm lessons as indicated in Table 15 (Fluency: $p = 0.002$; $d = 1.39$; interpreted as a very large effect size favoring Group B; Originality Total: $p < 0.001$; $d = 2.3$; interpreted as a very large effect size favoring Group B; Originality of Theme: $p = 0.01$; $d = 0.95$; interpreted as a large effect size favoring Group B; Elaboration Total: $p < 0.001$; $d = 1.47$; interpreted as a very large effect size favoring Group B; Emotional Expression: $p = 0.003$; $d = 1.27$; interpreted as a very large effect size favoring Group B; Storytelling Articulateness: $p = 0.003$; $d = 1.26$; interpreted as a very large effect size favoring Group B; Movement: $p =$

0.04; $d = 0.75$ interpreted as a medium effect size favoring Group B; Sound: $p = 0.04$; $d = 0.76$; interpreted as a medium effect size favoring Group B; Fantasy: $p < 0.01$; $d = 1.41$; interpreted as a very large effect size favoring Group B; Parody: $p = 0.04$; $d = 0.78$; interpreted as a medium effect size favoring Group B; Effectiveness of Title: $p = 0.002$; $d = 1.32$; interpreted as a very large effect size favoring Group B; Construction Skill: $p = 0.02$; $d = 0.89$; interpreted as a large effect size favoring Group B; Artistic Appeal: $p = 0.02$; $d = 0.89$; interpreted as a large effect size favoring Group B).

There were four instances of significant differences between Group A and Group B on the posttest as shown in Table 15. These occurred in elaboration (Elaboration: $p = 0.01$; $d = 0.97$; interpreted as a large effect size favoring Group B), effectiveness of title (Effectiveness of Title: $p = 0.009$; $d = 1.07$; interpreted as a large effect size favoring Group B), abstract ideas in title (Abstract Ideas in Title: $p = 0.04$; $d = 0.83$; interpreted as a large effect size favoring Group B) and total construction skills (Construction Skills: $p = 0.05$; $d = 0.73$; interpreted as a medium effect size favoring Group B). There are several possible reasons why Group B excelled on the posttest. The first possibility is that students from Group B initially performed the same as Group A, but they were inherently more talented in some areas with their abilities surfacing over time in response to the stimulus of creativity lessons. The second somewhat similar possibility is that being exposed to creative spatial construction first opened the students to be more creative in that work. Not only were they creative in their construction work, but during the following wordplay sessions they were primed to be creative. The reader should recall that data in Table 11 showed that during the daily wordplay lessons, Group B showed a

statistically significant advantage in 12 of 21 measures with Group A only outperforming Group B in two areas. Group A, in contrast, spent the first two weeks on wordplay, which some students indicated they viewed as unpleasantly challenging exercises rather than opportunities to be creative verbally. At the end of the study, Group A had experienced only two weeks of what many students had perceived as creative work (the construction work).

Table 15.

Comparison of Group A to Group B on Pretest, Midterm, and Posttest Scores for Construction Work

Measure	Time	Group A (initial wordplay lessons) Mean Score	Group B (initial construction lessons) Mean Score	*p* Value	Cohen's *d*	Significant Difference?
Fluency: total number of given objects used	Pretest	11.2 (1.5)	11.6 (0.8)	0.20	-	No
	Midterm	9.8 (1.7)	11.7 (0.7)	0.002	1.39	Yes, favoring Group B very large effect size
	Posttest	11.3 (1.2)	11.5 (0.7)	0.30	-	No
Originality: total score of original use of given items	Pretest	13.9 (4.9)	11.6 (4.5)	0.12	-	No
	Midterm	9.3 (4.1)	18.4 (4.0)	<0.001	2.3	Yes, favoring Group B very large effect size
	Posttest	15.8 (3.6)	17.2 (3.8)	0.20	-	No
Originality of theme of construction	Pretest	1.4 (0.7)	1.7 (1.2)	0.26	-	No
	Midterm	1.4 (1.2)	2.7 (1.6)	0.01	0.95	Yes, favoring Group B large effect size
	Posttest	1.8 (1.1)	2.4 (1.4)	0.12	-	No
Elaboration total	Pretest	1.8 (1.1)	1.0 (1.4)	0.38	-	No
	Midterm	1.3 (1.7)	3.4 (1.2)	<0.001	1.47	Yes, favoring Group B very large effect size
	Posttest	2.8 (0.8)	3.8 (1.2)	0.01	0.97	Yes, favoring Group B large effect size

(table continues)

Measure	Time	Group A (initial wordplay lessons) Mean Score	Group B (initial construction lessons) Mean Score	*p* Value	Cohen's *d*	Significant Difference?
Emotional expression: total instances	Pretest	2.0 (1.1)	2.2 (1.5)	0.38	-	No
	Midterm	1.6 (1.9)	4.1 (2.0)	0.003	1.27	Yes, favoring Group B very large effect size
	Posttest	3.3 (1.1)	4.2 (1.4)	0.06	-	No
Humor	Pretest	0 (0.0)	0 (0.0)	-	-	No instances found
	Midterm	0 (0.0)	0 (0.0)	-	-	
	Posttest	0 (0.0)	0 (0.0)	-	-	
Storytelling articulateness	Pretest	1.2 (0.4)	1.6 (1.2)	0.13	-	No
	Midterm	0.7 (0.7)	1.6 (0.8)	0.003	1.26	Yes, favoring Group B very large effect size
	Posttest	0.8 (0.6)	0.9 (0.5)	0.26	-	No
Movement or Action	Pretest	0.5 (0.5)	0.3 (0.5)	0.11	-	No
	Midterm	0.1 (0.3)	0.6 (0.9)	0.04	0.75	Yes, favoring Group B medium effect size
	Posttest	0.8 (1.1)	0.2 (0.4)	0.06	-	No
Sound or Talk	Pretest	0.2 (0.4)	0.3 (0.7)	0.23	-	No
	Midterm	0.0 (0.0)	0.7 (1.2)	0.04	0.76	Yes, favoring Group B medium effect size
	Posttest	0.1 (0.6)	0.2 (0.6)	0.40	-	No
Sensory Impact	Pretest	0.0 (0.0)	0.0 (0.0)	-	-	No
	Midterm	0.2 (0.4)	0.2 (0.4)	-	-	No
	Posttest	0.0 (0.0)	0.0 (0.0)	-	-	No
Breaking Boundaries	Pretest	0.8 (1.4)	0.5 (1.2)	0.32	-	No
	Midterm	0.6 (1.2)	0.9 (1.3)	0.26	-	No
	Posttest	0.3 (0.9)	0.0 (0.0)	0.18	-	No
Fantasy	Pretest	0 (0.0)	0 (0.0)	-	-	No Instances found on pretest
	Midterm	0 (0.0)	0.4 (0.4)	< 0.01	1.41	Yes, favoring Group B very large effect size
	Posttest	0 (0.0)	0.2 (0.6)	0.17	-	No
Parody	Pretest	0 (0.0)	0 (0.0)	-	-	No Instances found on pretest
	Midterm	0 (0.0)	0.8 (1.4)	0.04	0.78	Yes, favoring Group B medium effect size
	Posttest	0 (0.0)	0 (0.0)	-	-	No Instances found on posttest

(table continues)

Measure	Time	Group A (initial wordplay lessons) Mean Score	Group B (initial construction lessons) Mean Score	*p* Value	Cohen's *d*	Significant Difference?
Effectiveness of Title	Pretest	0.5 (0.8)	1.3 (1.2)	0.03	0.84	Yes favoring Group B; large effect size
	Midterm	1.0 (1.0)	2.0 (1.0)	0.002	1.32	Yes favoring Group B; very large effect size
	Posttest	1.0 (1.0)	2.0 (1.0)	0.009	1.07	Yes favoring Group B; large effect size
Abstract ideas in title	Pretest	0.0 (0.0)	0.2 (0.4)	0.08	-	No
	Midterm	0.2 (0.4)	0.4 (0.5)	0.10	-	No
	Posttest	0.0 (0.0)	0.3 (0.5)	0.04	0.83	Yes favoring Group B; large effect size
Wordplay shown in title	Pretest	0.0 (0.0)	0.08 (0.3)	0.17	-	No
	Midterm	0.0 (0.0)	0.0 (0.0)	-	-	No instances in both groups
	Posttest	0.0 (0.0)	0.0 (0.0)	-	-	No instances in both groups
Construction skills total score	Pretest	1.3 (1.3)	0.8 (0.6)	0.12	-	No
	Midterm	1.3 (1.0)	2.6 (1.8)	0.02	0.89	Yes, favoring Group B large effect size
	Posttest	1.7 (0.9)	2.4 (1.0)	0.05	0.73	Yes, favoring Group B medium effect size
Artistic Appeal	Pretest	2.6 (1.5)	2.0 (1.0)	0.14	-	No
	Midterm	1.1 (1.4)	2.3 (1.1)	0.02	0.89	Yes, favoring Group B large effect size
	Posttest	2.4 (1.3)	2.5 (1.8)	0.42	-	No
Resistance to Premature Closure	Pretest	1.0 (0.4)	0.7 (0.5)	0.45	-	No
	Midterm	0.3 (0.5)	0.7 (0.5)	0.06	-	No
	Posttest	0.8 (0.6)	0.5 (0.5)	0.06	-	No
Internal Visualization	Pretest	0.3 (0.9)	0.3 (0.5)	0.50	-	No
	Midterm	0.4 (0.8)	0.8 (0.6)	0.13	-	No
	Posttest	0.8 (1.0)	0.3 (0.6)	0.09	-	No
Three Dimensionality	Pretest	2.2 (1.5)	2.3 (1.0)	0.44	-	No
	Midterm	1.5 (1.4)	1.4 (1.6)	0.45	-	No
	Posttest	1.8 (1.7)	2.9 (2.0)	0.09	-	No

Attitude Survey Analysis and Discussion

Tables 16 through 19 display data concerning student enjoyment and perceived creativity during the lessons. All of the student ratings were based on a scale of one to ten with one meaning "did not enjoy it at all" or "not creative" and ten meaning "enjoyed it very much" or "very creative."

No significant difference was found between students in Group A and Group B regarding their enjoyment of work and their perceived level of creativity on the pretest, midterm lesson, or posttest (Table 16). The previous pretest scores showed no significant difference between student groups and so it is no surprise that student attitudes were very similar. The means of all student ratings on Table 16 were fairly high with the lowest scores being 7.4 and the highest 9.4. This indicates that students generally enjoyed the lessons quite a bit and perceived themselves as being quite creative.

Table 16.

Comparison of Group A to Group B on Pretest, Midterm, and Posttest Scores for Enjoyment of Work and Perceived Creativity

Measure	Time	Group A (initial wordplay lessons) Mean Score out of 10	Group B (initial construction lessons) Mean Score out of 10	*p* Value	Cohen's *d*	Significant Difference?
Enjoyment of Work	Pretest	9.0 (2.0)	9.0 (2.1)	0.38	-	No
	Midterm	7.4 (2.7)	7.5 (2.4)	0.47	-	No
	Posttest	8.7 (1.8)	8.3 (3.0)	0.37	-	No
Perceived Creativity	Pretest	8.6 (2.0)	8.9 (1.1)	0.28	-	No
	Midterm	7.8 (2.9)	8.1 (1.5)	0.36	-	No
	Posttest	9.4 (1.2)	8.4 (3.0)	0.15	-	No

Table 17 shows a significant difference in student attitudes during the proximal versus distal conditions of lessons (Enjoyment of Work in Wordplay: $p = 0.05$; $d = 0.04$; interpreted as a very small effect size favoring the proximal condition; Enjoyment of Work during Construction: $p = 0.006$; $d = 0.54$; interpreted as a medium effect size favoring the proximal condition). Perhaps the effect size was much smaller for wordplay because students struggled more to find words for their writings and so it didn't matter much whether the topic was distal or proximal. In contrast, the effect size for construction was greater because students noticed the more difficult task of generating a scene for the less familiar distal topics. No significant differences were found for perceived creativity.

Table 17.

Attitude Survey Results for Daily Construction Lessons Comparing Proximal to Distal Conditions

Analysis	Mean (Standard Deviation)		Paired *t*-test *p*-value	Cohen's *d*	Significant Difference?
	Proximal Condition	Distal Conditions			
Enjoyment of work during the wordplay lessons	7.7 (2.3)	7.6 (2.4)	0.05	0.04	Yes, favoring the proximal condition with a very small effect size
Enjoyment of work during the construction lessons	8.9 (1.1)	8.1 (1.6)	0.006	0.54	Yes, favoring the proximal condition with a medium effect size
Perceived creativity during the wordplay lessons	8.1 (1.7)	8.0 (1.6)	0.48	-	No
Perceived creativity during the construction lessons	8.9 (1.4)	8.4 (1.5)	0.09	-	No

Table 18 compares the attitudes of Group A to Group B to discern any potential differences. No significant difference was found between groups on enjoyment of the wordplay or construction lessons. Similarly, no difference was found between groups for perceived creativity in either the wordplay or construction lessons. This is further evidence that the student compositions of Group A and Group B were very similar.

Table 18.

Attitude Survey Results for Daily Construction Lessons Comparing Group A to Group B

Analysis	Mean (Standard Deviation) Group A	Group B	*t*-test *p*-value	Cohen's *d*	Significant Difference?
Enjoyment of work during the wordplay lessons	7.6 (2.2)	7.8 (2.4)	0.38	-	No
Enjoyment of work during the construction lessons	8.6 (1.5)	8.5 (1.0)	0.47	-	No
Perceived creativity during the wordplay lessons	8.0 (1.8)	8.3 (0.8)	0.31	-	No
Perceived creativity during the construction lessons	8.9 (1.3)	8.4 (1.0)	0.13	-	No

Table 19 compares student attitudes collected during the wordplay lessons to those collected during the construction lessons. Every rating made by a student for every daily lesson was compiled and sorted by wordplay or construction condition. A mean for the enjoyment of the lesson rating and for the perceived creativity rating was calculated and is shown in Table 19. A *t*-test was conducted to determine if there was a significant difference in student attitudes toward the two types of lessons. The results showed that

students preferred the construction lessons for enjoyment and also for perceived creativity (Enjoyment: $p = 0.0002$; $d = 0.39$; interpreted as a small effect size favoring the construction condition; and Perceived Creativity: $p = 0.03$; $d = 0.20$; as a small effect size favoring the construction condition).

Table 19.

Attitude Survey Results for Daily Lessons Comparing Wordplay to Construction

Analysis	Mean Rating of All lessons under this Condition (Standard Deviation)		*t*-test *p*-value	Cohen's *d*	Significant Difference?
	Wordplay	Construction			
Enjoyment of work	7.6 (2.8)	8.6 (2.3)	0.0002	0.39	Yes, favoring the construction condition with a small effect size
Perceived Creativity	8.2 (2.5)	8.7 (2.3)	0.03	0.20	Yes, favoring the construction condition with a small effect size

Additionally, to see the effect on individual students of the two conditions, a mean of ratings for lessons under each condition was calculated for each student. These two pools of data were compared with a paired *t*-test for enjoyment and another paired *t*-test for perceived creativity. The results of this analysis are shown in Table 20.

Table 20.

Attitude Survey Results for Daily Lessons Comparing Wordplay to Construction Comparing Paired Individual Student Averages under the Two Conditions

Analysis	Mean of the mean rating for each Student under each Condition (Standard Deviation)		Paired *t*-test *p*-value	Cohen's *d*	Significant Difference?
	Wordplay	Construction			
Enjoyment of work	7.6 (2.2)	8.7 (1.4)	0.02	0.58	Yes, favoring the construction condition with a medium effect size
Perceived Creativity	8.1 (1.4)	8.7 (1.3)	0.02	0.45	Yes, favoring the construction condition with a small effect size

As noted earlier, students enjoyed the construction lessons more than the wordplay lessons and perceived themselves to be more creative during those lessons as well. Table 21 shows the reasons students gave for their enjoyment ratings of the construction lessons, while Table 22 lists the reasons students gave for rating their enjoyment of the wordplay lessons. The most frequent comment under both conditions was that students found the lesson activities to be fun and enjoyable. The next-most frequent comments related to the particular activity of making a construction or practicing wordplay skills. Five comments in the construction condition complained that the topic was not interesting, while several comments in the wordplay condition alluded to the difficulty of the writing task.

Table 21.

Student Reasons Given for Enjoyment Rating of the Construction Condition

Frequency	Student Rationale for Rating of Enjoyment
30	The activity was a lot of fun
19	Making things was enjoyable
12	I learned about the topic through making the construction
7	My product turned out well
6	I used my imagination
5	I liked the topic we studied
5	I did not like the topic
5	It was a very creative activity
5	Art is something I love
4	I liked everything about it
3	There was a variety of topics and of things used
2	I made a replica or model of something
2	I depicted people helping

Table 22.

Student Reasons Given for Enjoyment Rating of the Wordplay Condition

Frequency	Student Rationale for Rating of Enjoyment
25	The lesson activities were fun and enjoyable
14	I liked practicing this particular wordplay skill
12	I felt that I had accomplished something
9	I enjoyed manipulating the objects in the layouts.
8	I learned more about the given topic
5	The writing was way too hard or challenging
5	I enjoyed everything
5	It was boring
3	I don't know
3	I didn't like the topic
2	I was able to work independently
2	I enjoyed the challenge
1	I don't like wordplay
1	I didn't try very hard

Tables 23 and 24 list reasons students gave during the construction and wordplay conditions, respectively, for their perceived creativity levels. In general, students recognized that they were creative in general or had creative or effective products. Another aspect that occurred fairly frequently was mention of effort: in the construction condition, students recognized the positive results of effort; whereas in the wordplay condition, students admitted that they had not put forth much effort and that is why their work was not very creative. There were twice as many (15 compared to 7) comments explaining why the student was not creative in the wordplay condition compared to the construction condition.

Table 23.

Student Reasons Given for Perceived Creativity Rating of the Construction Condition

Frequency	Student Rationale for Rating of Enjoyment
15	I was very creative
15	I had a clever idea for my product
12	I really tried or put time and effort into it
11	I had a lot of fun
10	My product turned out well
7	I was original because I made something no one else made
7	I liked the topic a lot
6	My work did not turn out well
5	I generated a lot of ideas for the scene
1	My speech bubbles were creative
1	My personality showed through my sense of humor
1	I used rhymes
1	I learned new things
1	It was easy for me to do
1	I had difficulty generating ideas

Table 24.

Student Reasons Given for Perceived Creativity Rating of the Wordplay Condition

Frequency	Student Rationale for Rating of Enjoyment
28	I felt that I had accomplished something
15	I am very creative in most things
9	I didn't try hard or my results were disappointing
8	I enjoyed practicing this particular wordplay skill
6	It was fun
5	I learned more about the given topic
5	It was boring
3	I liked doing the wordplay work
2	I enjoyed handling the objects and cards
1	It was way too hard
1	I don't know
1	Because we did it during a field trip to the university
1	It was funny
1	I made the teacher laugh
1	I liked everything

Researcher's Observations of Students During the Lessons

This section includes comments verbalized by students recorded in the daily notes kept by the researcher. The remarks given here were typical of those encountered and reveal student attitudes.

Students' Comments about the Distal Condition.

Students often seemed dismayed to be given a distal topic, telling their emotional reactions with comments such as, "Oh, Nooooo! Not again! … Yesterday it was much more interesting," and "Can we write about something else?" Their lack of familiarity with the distal topics was exemplified in such statements as, "I don't know what to write

about the Revolutionary War!" or, regarding the topic of the solar system, "I don't know how to write about it!" Students expressed their judgment of the distal Revolutionary War-related activity as, "Boring, because I don't know what to write." Although the Revolutionary War is part of the fifth grade social studies curriculum, another student remarked, "Come on! It is like an *8th grade* topic! When assigned fossil life as the topic, even after a review of common fossils, a student in the construction condition complained, "I don't know what to make about this!" In response to being asked to focus on the geometric shapes of ancient buildings such as pyramids, another student whined, "Why can't we make a construction of something like the Young Arena [a local arena], or this table or my room?

Students' Comments about the Proximal Condition

The researcher recorded many representative comments about the more familiar proximal condition work. One student exclaimed with excitement: "I know what I'm gonna make now! … I don't know what to choose. I have several, *so good* ideas!" Another student remarked when the topic was backyard birds, "Finally, something interesting!" while another student asked classmates, "Anybody need help? I have read three books about them and my aunt has a birdfeeder, so I watch them when I am at her place." Students perceived themselves as more creative during the proximal work, expressing, "I was creative because I like birds!" or "I was creative because I know a lot." Another announced to classmates, "I was creative because I liked the topic." Familiarity was important as a student commented, "I had fun today because it was easy

today because I know about recycling" Another student who knew about the bones in his body remarked, "Can we talk about skeletal system tomorrow, too?"

Student Strategies for Making Products

The researcher noted the most frequent approaches of students to the task of making a creative construction related to a given academic topic. In general, students attempted to identify a place or an event to depict with a scene, rather than making an object or person with the construction materials. The scene was preferable because students could begin work without having every aspect thought-out in advance, making the basic layout of the room or area, and then adding details and items to the scene as work progressed. For example, concerning the proximal topic of backyard birds, the following scenes were produced: a bird habitat with bushes, trees, and grass; an interior birdhouse scene with a nest, perch, and food, and eggs; and a bird clubhouse interior with a TV, bird toys, food, tables, and chairs. Distal topics posed greater challenges. For the Revolutionary War, several students made a Boston Tea Party scene with people dumping tea from a ship; others made a battlefield scene showing the Redcoats and colonists; one student made a building with a lantern in it for the famous saying, "one if by land, two if by sea." A very unique student scene showed a realistic lobster trap with a lobster person inside representing a Redcoat British soldier (often called "lobsterbacks") who was being caught by the colonists.

Students in the wordplay condition depended more heavily on the given sheet of content information, choosing terms from it for their wordplay. Sometimes, they took one of the example wordplay writings such as a movie title or product slogan and attempted

to substitute words form the fact sheet for words in the example. Many students chose rap because of its popularity in their neighborhoods. These students were successful in keeping the rhythm of their words constant, but many found rhyming somewhat difficult. Examples of student construction and writing are shown in the Appendix.

Chapter Summary

This chapter presented the results of the study addressing the research questions posed at the beginning of the study. Main findings discussed in this chapter, related to the five research questions were the following: (1) Study results showed that creative skills may be transferred from the creative construction condition to the creative wordplay condition. However, the transmission of creative skills from the wordplay condition to the creative construction condition was not evidenced in this study. (2) Generally, students showed greater creativity when working on proximal topics, perhaps because they had more knowledge, familiarity, experience, and ideas for these topics. (3) Student strategies included determining a place or event for construction of a scene or use of words from the information sheet injected into the given examples of possible writings to compose a new writing. (4) and (5) Student enjoyment of the lessons was affected by the distal or proximal nature of the given topic, but the perceived ratings of creativity were not affected by the distal or proximal conditions.

The following chapter presents a more detailed summary of the results of all research questions addressed in the study, implications for future research, and teacher practices as well as the limitations of the current study.

CHAPTER 5

CONCLUSION

Summary of Results for the Research Questions

This study attempted to address several current research issues in creativity. The first issue was to determine if general creative skills obtained in one domain could be transferred to another domain, in this case, from wordplay work to creative construction work and vice versa. The second major premise investigated was whether Construal Level Theory seemed to operate when the proximal or distal condition was interwoven with the creative activity rather than being an initial priming event. In the current study, daily topics for creative work were chosen to alternate between proximal and distal themes. Creative products (writings or constructions) were examined to determine how creative strengths were manifested. They were also inspected to determine strategies students used to meld given content into their creative products. Finally, student responses to an attitude survey administered after each lesson were analyzed to see the connections between level of enjoyment or perceived level of creativity and the proximal or distal aspect of the task and the type of creative product. The following formal research questions were addressed by the study:

1. Can creative strengths be transferred from one domain to another?
2. Do students evidence more creativity when the applied academic content area is perceived as distant (distal) in time, space, probability and society from them as

compared to close (proximal) in time, space, probability and society as claimed by previous studies?

3. What strategies do students use to integrate academic content with creative products?

4. How do students perceive their levels of creativity in the products they make?

5. How do students report their enjoyment of the creative process as the project progresses?

Table 25 presents each research question with a summary of pertinent findings from the study.

Table 25.

Research Questions with Summarized Findings

Research Question	Findings from the Study
1. Can creative strengths be transferred from one domain to another?	Evidence from the daily wordplay work in Table 11 shows that Group B members who had first learned creative construction skills were able to outperform on 12 out of 21 measures Group A members who had been the first group to work on wordplay. In contrast, as shown in Table 14, there were only 2 out of 22 measures (movement/action and artistic appeal) in which Group A outperformed Group B in the daily construction work. This finding indicates that creativity skills might possibly be transferred from spatial construction work to the verbal domain but there is little evidence that verbal creative practice transfers to construction.

(table continues)

Research Question	Findings from the Study
2. Do students evidence more creativity when the applied academic content area is perceived as distant (distal) in time, space, probability and society from them as compared to close (proximal) in time, space, probability and society as claimed by previous studies?	An analysis of the wordplay data in Table 9 showed that 6 out of 21 measures (elaboration, sensory impact, breaking boundaries, artistic appeal, resistance to premature closure) found significant differences with small effect sizes for proximal topics; only two measures with small effect sizes (emotional expressiveness and fantasy) favored the distal condition. All other measures for wordplay showed no significant difference between conditions. Table 13 showed that 5 out of 21creative construction measures favored the proximal condition with medium effect sizes. No significant differences favoring the distal condition were found. The expected increase in creativity during the distal condition suggested by Construal Level Theory was not confirmed by these findings. In fact the opposite seems to be true; students showed more creativity during proximal topics.
3. What strategies do students use to integrate academic content with creative products?	The researcher's daily log, oral student explanations recorded by the researcher, and observations of students' products provided information to answer this question. Students were able to integrate academic content with creative products in the following ways: (1) recreating an event from the given list of information on the assigned topic, discussed during the introduction to the topic (e.g. signing the Declaration of Independence, Boston Tea Party; Personal safety issues illustrated by robbery of a store or a home break-in; (2) the most common way students used was creation of a scene somehow related to the content topic (e.g. a skate park, a pool, a destroyed nuclear power plant); (3) during the wordplay lessons students often used the information sheet to gain words related to the topic and combined them with examples of writing provided by the researcher; (4) during the construction lessons students did not have the need to use particular words and created a construction based on the general understanding of the theme.
4. How do students perceive their levels of creativity in the products they make?	Students rated their perceived levels of creativity rather high during the lessons with most mean ratings being 8 or higher on a ten-point scale. The perceived creativity ratings did not seem to be affected by the proximal or distal nature of the given topic.
5. How do students report their enjoyment of the creative process as the project progresses?	Students rated their enjoyment of the lessons fairly high with mean ratings starting at 7.4 on a ten-point scale. Students preferred proximal to distal topics for both wordplay and construction for enjoyment with small to medium, effect sizes.

Research Question 1 Regarding Transfer of Creativity across Domains

The results of this study suggest that concrete, hands-on modeling as done during the construction activities, may promote openness to absorbing creative skills, which transfers across domains to the verbal arena. When a student investigates a problem through manipulation of concrete materials, the student can not only be tactilely

stimulated, but can visually represent and change mental ideas by moving physical items. Root-Berstein and Root-Bernstein (2013) found arts work particularly important to nurturing science ability. They stated, "The more arts and crafts that scientists, engineers, and entrepreneurs engage in across their lifetimes, the greater their likelihood of achieving important results in the workplace" (p.18). In the current study, the model made of given recycled and craft items was a physical representation of the mental ideas on which the student sought to operate. Instead of having to mentally picture how a change would affect the model, the student could easily move the items around and then judge the results. Generally, a teacher moves students from the concrete level to increasingly abstract tasks. In the case of wordplay, the investigator provided actual objects to represent words, their sounds, or meanings through the "object box" sets so that students could begin by practicing the wordplay concepts at a concrete level. The creative wordplay products required much mental manipulation of words and sounds, although students could write drafts and edit them as they desired.

The results of the current study suggest a one-way transfer of creativity skills from construction to wordplay. Students who began their summer program by working in the construction condition practiced creativity skills in a very concrete hands-on manner that assisted them in internalizing these skills. When they moved to wordplay, they were open to creative expression and ready for the challenge of more mental manipulation required by wordplay. In contrast, students who began their summer program in wordplay may have found it so challenging and psychologically taxing with their limited vocabularies and academic background knowledge that there was little energy left for

thinking creatively after they had applied the given theme to the wordplay task. This suggestion is supported by student comments recorded by the investigator during the activities and by responses written by students on the attitude surveys. These students then entered the construction work without bringing forward as large a repertoire of creative skills as those who began in construction. The posttest scores for wordplay, completed at the end of the four-week unit, showed only one small area of statistically significant difference between the groups. This was in the area of "wisdom or insight" and favored Group B. In wordplay on the posttest, both groups performed similarly, although the daily wordplay lessons indicated otherwise (Group B dominated in 12 of the 21 measures). This shows that Group A caught up with Group B in creative wordplay skills after having the construction experience.

On the construction posttest, Group B outperformed Group A in four areas (elaboration, abstract ideas in title, construction skills, and effectiveness of title). Two of these skill areas were verbal skills concerning the written title for the constructed scene. Perhaps because Group B started with construction in which they had to title their work, they reinforced these two ideas through their subsequent wordplay work.

Research Question 2 Addressing Construal Level Theory

Construal Level Theory states that thinking about psychologically distal topics (topics distant in space, time, probability, and culture/experience) promotes abstract thought because the person lacks specific knowledge. This abstract thought leads to more general categorization of ideas and the possibility of making more creative connections or of generating additional ideas in the categories. In other words, when thinking about a

distal topic, students might fill the blank areas of their knowledge with creative, imagined ideas. To test this, in this study, students were asked to relate their creative products to a theme that was either proximal (close to them in space, time, probability or experience) or distal (distant in those areas).

Student products scored for creativity under each condition (proximal or distal) did not show the expected pattern of higher creativity scores under the distal condition as predicted by Construal Level Theory. In fact, the opposite effect was observed in many instances.

Several previous researchers conducted experiments to test Construal Level Theory (Stephan, Liberman, & Trope, 2010; Subbotsky et al., 2010). None of these studies tested all four dimensions of distance (space, time, probability, and culture/experience) at the same time. Additionally, these previous studies only "primed" the participants with an initial activity to get them in the desired mental state, and then offered them an unrelated task that was subsequently assessed. The current study integrated the main creative activity directly with the proximal or distal content so that participants focused on its proximity or distance all the time they worked. Therefore, if these four dimensions of distance actually do affect creativity, this should have been *pronounced* in the current study. Instead, the findings showed more evidence for proximal topics being related to higher creativity scores.

One possibility is that the population of students who participated in the current study was markedly different from populations in other studies. The participants of the current study were urban sixth grade students who had been admitted to the summer

enrichment program because of their need for additional academic schoolwork and for enrichment in creativity and leadership skills. Most of these participants had spent their school years in the same school district that heavily emphasized assessment and attainment of basic skills. The opportunities during the elementary years for subject and arts integration were limited. In fact, the researcher's observations of student conversations support this premise. Two students who had just completed a construction activity discussed how they had not been allowed to use scissors and glue at school because it was "messy." Students with limited academic background knowledge and restricted experience in creative endeavors may not react to distal stimuli in the same manner as those with a wealth of experience. A student with greater experience may find "distal" topics familiar and comfortable to investigate, whereas a student with very limited experience may find these topics more stress-provoking. The student enjoyment ratings of the current study showed that although students found most lessons enjoyable, they preferred the proximal topics over the distal ones.

Research Question 3 Concerning Student Strategies

During the construction condition, students tended to build a scene or a place (e.g. room, cave, or gym) more often than creating an object, mechanism, or person related to the topic of study. A possible reason might be that students could begin working on the scene and create a basic, generic layout immediately. Therefore, this strategy provided time to generate more specific and unique ideas related to the theme of the lesson while constructing parts with which they were familiar. The distal topics were more challenging

for students because it was harder for them to produce an initial idea with which they were familiar enough to begin construction of a scene.

The wordplay condition was more challenging for the six graders. Students used the information sheets and the sheets with poetry examples more often. Some students copied the examples and substituted one or two words into those to make their writing related to the topic of the lesson.

Research Question 4: Students' Perceived Creativity

Generally, students rated their creativity fairly high during both wordplay and construction conditions (Wordplay average perceived creativity rating = 8.1 or 8.2 out of 10; Construction average perceived creativity rating = 8.7 out of 10). The analysis of students' comments revealed that they gave more specific reasons for creativity during the construction work, supporting their higher rating for that condition. For example, one participant explained personal creativity during the construction condition as, "I used my imagination." Another student comment was, "It shows my personality and my sense of humor." A third student remarked, "I came up with a lot of different combinations." Fifteen students mentioned a particular creative aspect of their constructions. These were grouped into the category of "I had a clever idea for my product." In contrast, student reasons given for creativity during wordplay, except for two instances of using humor (e.g., "I made the teacher laugh"), were general statements of overall creativity (e.g., "I am very creative in most things") or statements about liking or disliking the activity.

The perceived level of creativity of students evidenced by mean student ratings during wordplay and construction lessons was not affected by the topic being distal or

proximal. However, during construction lessons, the researcher noted students frequently expressed that they were more creative during proximal topics than during distal topics. Perhaps this result was caused by the fact that they had more knowledge of the topics to mix and match in various ways. The rationale the students provided for their ratings of perceived creativity during the construction lessons was usually more positive than during the wordplay condition. They stated that they put a lot of effort and time into the construction work in contrast to the wordplay work. Students also indicated that they were able to generate clever and unique ideas in the construction condition, but not in the wordplay condition.

Research Question 5: Students' Enjoyment of the Activities

Overall, the students rated their enjoyment during both conditions fairly high (Wordplay average enjoyment rating = 7.6 out of 10; Construction average enjoyment rating = 8.6 or 8.7 out of 10). However, the analysis of students' surveys for the daily lessons indicated that they enjoyed the construction condition more than the wordplay condition. Some of the students' comments about the challenges of wordplay were: "It was too hard to use with birds;" "It was kind of hard when it came to vowels;" "Too much work;" and "Way too hard!" Additionally, several students chose manipulatives (laying out objects and cards) as their favorite part of the wordplay condition. This supports the fact that they enjoyed hands-on work more than work involving mental word manipulations. Many of the students noted that they liked the tactile and color stimuli. This finding supports the conclusions made by Root-Bernstein and Root-Bernstein

(2013). They stated that arts integration is pleasant, joyful, and beneficial for students' development and learning.

Similarly, the sixth graders enjoyed both proximal and distal topics (Wordplay average enjoyment rating for proximal = 7.7 out of 10; for distal = 7.6 out of 10; Construction average enjoyment rating for proximal = 8.9 out of 10; for distal – 8.1 out of 10), although the attitude survey results showed that in both the wordplay and construction conditions, students preferred proximal topics to distal. Possibly, the reason for this outcome is that students felt more comfortable working with familiar themes that were closer to their experience. One student made a comment during the lesson that he or she had read a lot about the topic of backyard birds and therefore was knowledgeable. That student offered to share creative ideas with classmates.

Implications for Classroom Practice

The Need for More Concrete, Hands-on Craft Experiences

Many of the students in this study were unfamiliar with basic material properties of the items used in construction. For example, oftentimes, students would attempt to glue a large, heavy item on top of a narrow, flimsy straw or stick and persisted even after the stick bent and the item fell off. Students were unfamiliar with surface properties of materials, not understanding that impermeable surfaces like plastics do not absorb craft glue and do not easily stay stuck together. Some of the instruction during the construction lessons was designed to remedy this issue. For example, there were lessons on increasing glue contact area on attached pieces, making a flange, and rolling a cone or cylinder from flat paper. This lack of experience in understanding how common materials fit together

and can be attached to each other might be remedied by more opportunity to play and complete art or invention projects with found materials.

Students thoroughly enjoyed the construction lessons and the manipulation of items in the object boxes for wordplay. These hands-on activities maintained student focus, motivated students, reduced stress, and allowed creative play. Schools could find ways to switch from more abstract thinking-reading-writing work to more hands-on work to allow students to maintain interest and appropriate behavior throughout the school day. Because, in the current study, creative thinking skills were transferred after students engaged in construction work, teachers might build into academic areas art projects or modeling of the concepts studied.

Hands-on Work for Developing Language Skills

One of the findings of this study is that creativity skills were possibly transferred from the construction condition to the wordplay condition. A Root-Bernstein and Root-Bernstein (2013) have noted, recognition and formation of patterns is supported by arts-integration. Language, and especially wordplay, depends upon patterns such as repeating rhythms, rhyming (repetition of the same ending sounds), alliteration, or whole-word sounds as in homophones. Integration of arts and crafts work may positively assist students in developing general pattern recognition skills.

The hands-on language materials used in this study were first developed for Montessori classrooms. Montessori thought that the key to directing a student's attention was through interest and manipulation of objects (Lilliard, 2005). Repeated voluntary movement of objects is important for a student's mental development (Standing, 1984).

Manipulation of items may also build students' attention spans (Stewart, Rule, & Giordano, 2007).

A student completing a layout of objects with word or definition cards like the sets employed in this study practices organizational skills and builds mental schema related to the concrete representations of the language concepts. Not only are the materials and activities motivating, but students can absorb and practice the verbal concepts in a concrete manner. Because these object and card sets were met with great student interest, enthusiasm, and joy, enabling students to concretely understand what homophones or alliteration patterns were, the researcher recommends that schools adopt similar materials for teaching language concepts. The students in this study were beginning sixth graders who wholeheartedly embraced the concrete materials, never indicating that they felt they were too mature for these activities. Jumping too rapidly from concrete language materials to abstraction, as is occurring in many elementary schools that resort to much mental and verbal manipulation of language without concrete representation, may hinder language development.

The Need for Culturing a Classroom Environment that Values Creativity

The researcher observed that students continually required positive reinforcement of their ideas during both construction and wordplay. Students seemed to want to know if each choice was right or wrong, consulting with peers or copying their work when the researcher was preoccupied with other students. Even though students knew that their work during these lessons was not going to be evaluated for a grade, they still were anxious to be told that their work was "correct" and to see that peers were doing things

the same way. These observations point to a prior exposure to classroom environment that valued one right answer or "correct" way of doing things – convergent thinking. During the construction and wordplay lessons in this summer program, the researcher stressed divergent thinking and valuing of diverse ideas.

The current No Child Left Behind school atmosphere of standardized testing has seemed to promote a convergent view of learning facts rather than a more creative exploration of concepts and possibilities (Au, 2007). In a qualitative methasynthesis of 49 studies, Au (2007) concluded, "The primary effect of high stakes testing is that curricular content is narrowed to tested subjects, subject area knowledge is fragmented into test-related pieces, and teachers' increased the use of teacher-centered pedagogies" (p. 258). This educational situation is at odds with the twenty-first century skills movement that has promoted creativity, innovation, problem-solving and technology skills for personal and national economic growth. Classroom teachers need to find ways to integrate creativity into the prescribed school curriculum to benefit students and the nation.

This study provided examples of effective ways to integrate creativity skills into the academic curriculum. Each lesson in this study included a fact sheet and discussion of science, social studies, mathematics, or health concepts followed by their practice through either making a three-dimensional construction or by composing a short writing piece related to the topic. Similar projects might be integrated into the regular school curriculum to advance creative thinking skills and maintain student motivation.

Study Limitations and Suggestions for Future Research

This study was limited to a pre-existing sample of 24 early sixth-grade students from one school district in Iowa. The summer program was designed to serve students from a particular urban middle school who showed academic promise and leadership but who needed additional summer skill work to develop their potentials. The researcher has inferred that the unusual results of this experiment lacking support for Construal Level Theory possibly may be due to the effects of creatively- and concretely-limited prior schooling experiences of the study participants in an educational system heavily influenced by No Child Left Behind legislation (Au, 2007). Construal Level Theory requires the use of abstract thought to generate creative ideas. Students who were not provided with concrete experiences and opportunities to build a background supporting more abstract thinking, mental visualization, and pattern recognition may not be able to produce many creative ideas when given distal stimuli. Therefore, a future study of similar-aged students from educational backgrounds that focused on concrete experiences and arts and crafts integration into the curriculum (perhaps a Montessori school population or students from a school focused on arts-integration) replicated with the same materials and given themes might be conducted and results compared to determine how the sample population impacts the results.

The current study was also limited by the four-week length of the summer program for students. Perhaps, if the researcher had a longer period of time available to work with students, then the periods of implementation of the wordplay and construction conditions could have been longer. This might have resulted in a clearer picture of the

transferability of creativity skills from the wordplay condition to the construction condition. The longer period of time allocated for the study could also have resulted in more time for students to develop background knowledge and a creative mindset that consequently could influence creative production.

Another suggestion for future research would be to examine the effects of fantasy as an element of the Construal Level Theory on students' creative products. A recent doctoral dissertation (Webb, 2013) investigated the effects of reading fantasy versus nonfiction texts on second graders' creativity, finding that students were more creative in making figural transformation drawings after reading nonfiction texts. The researcher is interested in testing the effects of nonfiction texts in comparison to fictional texts on the level of students' creativity in construction and wordplay.

REFERENCES

Alliteration. (2012). In *Dictionary.com – Online dictionary.* Retrieved from http://dictionary.reference.com/

Assessment & Teaching of 21st Century Skills. (2012). *What are 21st century skills?* Retrieved May 25, 2012 from http://atc21s.org/index.php/about/what-are-21st-century-skills/

Assonance. (2012). In *Dictionary.com – Online dictionary.* Retrieved from http://dictionary.reference.com/

Au, W. (2007). High-stakes testing and curricular control: A qualitative metasynthesis. *Educational Researcher, 36*(5), 258-267.

Beghetto, R. A. (2008). What we know about creativity enhancement. In J. A. Plucker & C. M. Callahan (Eds.). *Critical Issues and Practices in Gifted Education: What the Research Says (* pp. 139 - 154). Waco, TX: Prufrock Press.

Bhatnagar, S. (Producer), & Sipi, R. (Director). (1972). *Seeta aur Geeta* [Motion picture]. India: Sippy Films.

Clarke, M., Shore, A., Rhoades, K., Abrams, L. M., Miao, J., & Li, J. (2003, January). *Perceived effects of state-mandated testing programs on teaching and learning: Findings from interviews with educators in low-, medium-, and high-stakes states.* Boston, MA: National Board on Educational Testing and Public Policy, Lynch School of Education, Boston College. Retrieved May 23, 2012, from http://www.bc.edu/research/nbetpp/reports.html

Csikszentmihalyi, M. (2008). *Flow: The psychology of optimal experience.* New York, NY: Harper Perennial Modern Classics.

Csikszentmihalyi, M., & Wolfe, R. (2000). New concepts and research approaches to creativity: Implications of a systems perspective for creativity in education. In K. A. Heller, F. J. Monks, R. J. Sternberg, & R. E. Subotnik (Eds.), *International handbook of giftedness and talent* (2nd ed.; pp. 81-93). New York, NY: Elsevier.

Davis, G. A., Rimm, S. B., & Siegle, D. (2011). *Education of the Gifted and Talented* (6th ed.). Boston, MA: Pearson.

Delcourt, M. A. B. (1993). Creative productivity among secondary school students: Combining energy, interest, and imagination. *Gifted Child Quarterly, 37*(1), 23-31.

Education Connection, (2012). *Center for 21st century skills at Education Connection.* Retrieved May 25, 2012 from http://www.skills21.org

Förster, J., Friedman, R. S., & Liberman, N. (2004). Temporal construal effects on abstract and concrete thinking: Consequences for insight and creative cognition. *Journal of Personality and Social Psychology, 87*(2), 177-189.

Guilford, J. P. (1967). *The nature of human intelligence.* New York, NY: McGraw-Hill Book Co.

Guilford, J. P. (1977). *Way beyond the IQ.* Great Neck, NY: Creative Synergistic Associates.

Guilford, J. P., & Hoepfner, R. (1971). *The Analysis of intelligence.* New York, NY: McGraw-Hill Book Co.

Hannaway, J. & Hamilton, L. (2008*). Performance-based accountability policies: Implications for school and classroom practices.* The Urban Institute and RAND Corporation. Retrieved May 24, 2012 from http://www.urban.org/UploadedPDF/411779_accountability_policies.pdf

Hink-pink. (2012). In *Dictionary.com – Online dictionary.* Retrieved from http://dictionary.reference.com/

Homophone. (2012). In *Dictionary.com – Online dictionary.* Retrieved from http://dictionary.reference.com/

Jia, L., Hirt, E., R, & Kapren, S. (2009). Lessons from a Faraway land: The effect of spatial distance on creative cognition. *Journal of Experimental Social Psychology. 45*, 1127-1131.

Liberman, N., Polack, E., Hameiri, B., & Blumfeld, M. (2012). Priming of spatial distance enhances children's performance. *Journal of Experimental Child Psychology, 111*, 663-670.

Lillard, A. S. (2005). *Montessori: The science behind the genius.* New York, NY: Oxford University Press.

McNeil, L. M. (2000). *Contradictions of school reform: Educational costs of standardized testing.* New York, NY: Routledge.

Michalko, M. (2001). *Cracking creativity: The secrets of creative genius.* Berkeley, CA: Ten Speed Press.

Milgram, R. M., & Milgram, M. A. (1976). *Tel Aviv creativity test (TACT).* Ramat-Aviv, Isreal: Tel Aviv University, School of Education.

Moon, S. M., & Fedhusen, J. F. (1993). Accomplishments and future plans of high school seniors who participated in an elementary enrichment program. *Roeper Review, 15*(3), 176-178.

Myers, R. E. (1960). *Creative writing and training in divergent thinking.* Unpublished Master's paper. Reed College, Portland, Oregon.

Osborn, A. (1957). *Applied imagination* (1st ed.). New York, NY: Scribners.

Osborn, A. (1963). *Applied imagination* (3rd ed.). New York, NY: Scribners.

O'Quin, K.,& Besemer, S. P. (1989). The development, reliability, and validity of the revised creative product semantic scale. *Creativity Research Journal, 2,* 267-278.

Parnes, S. J. (1981). *Magic of your mind.* Buffalo, NY: Creative Education Foundation.

Partnership for 21st Century Skills (2011). *A framework for 21st century learning.* Retrieved May 25, 2012 from http://www.p21.org/home

Piirto, J. (2004). *Understanding creativity.* Scottsdale, AZ: Great Potential Press, Inc.

Plucker, J. A. (2004) Generalization of creativity across domains: Examination of the method effect hypothesis. *Journal of Creative Behavior*, 38, 1-12.

Plucker, J. A., & Callahan C. M. (Eds.) (2007). *Critical Issues and Practices in Gifted Education: What the Research Says.* Waco, TX: Prufrock Press.

Price, I. (2000). *Between groups vs repeated measures design.* School of Psychology University of New England. Retrieved May 17, 2012 from http://www.une.edu.au/WebStat/unit_materials/c2_research_design/between_repeated_measure.htm

Rentner, D. S., Scott, C., Kober, N., Chudowsky, N., Chudowsky V., Joftus S., & Zabala, D. (2006). *From the capital to the classroom: Year 4 of the No Child Left Behind Act. Center on Education Policy.* Retrieved May 23, 2012 from http://www.cep-dc.org/displayDocument.cfm?DocumentID=301

Renzulli, J. S., Smith, L. H., White, A. J., Callahan, C. M., & Hartman, R. K., (1976). *Scales for rating the behavioral characteristics of superior students.* Mansfield Center, CT: Creative Learning Press.

Rimm, S. B. (1980). *Group inventory for finding creative talent (GIFT)*. Waterton, WI: Educational Assessment Service.

Root-Bernstein, R., & Root-Bernstein, M. (2013, February). The art and craft of science: Scientific discovery and innovation can depend on engaging more students in the arts. *Educational Leadership,*16-21.

Rule, A. C., Alkouri, Z. A., Criswell, S. J., Evans, J. L., Hileman Webb, A. N., Parpucu, H., ... Zhbanova, K. S. (in press for November, 2012). Practicing creative thinking skills by making creative products related to economic issues. *Social Studies Research and Practice,7*(3).

Rule, A. C. & Barrera, M. T., III. (2003). Using objects to teach vocabulary words with multiple meanings. *Montessori Life, 15*(3), 14-17.

Rule, A. C., Stewart, R. A., & Haunold, J. (2005). Object boxes for tutoring in a literacy lab at a year round elementary school. *Journal of Authentic Learning, 2*(1), 80-88.

Rule, A. C., Zhbanova, K., Hileman Webb, A., Evans, J., Schneider, J. S., Parpucu, H., … Ruan, B. (2011). *Creative product problem-solving game: Exploring Torrance's creative strengths by making an object from a set of given materials.* ERIC Document Reproduction Service No. ED527045

Schenitzki, D. P. (1961). *Adult evaluation and peer evaluation as factors in creative thinking*. In E. Paul Torrance (Ed.) *New educational Ideas: Proceedings of the Third Minnesota Conference on Gifted Children*. (128-145) Minneapolis: Center for Continuation Study, University of Minnesota, MN.

Schlichter, C., & Palmer, W. R. (1993). *Thinking Smart: A Primer of the Talents Unlimited Model.* Mans-field Center, CT: Creative Learning Press, 226 p.

Schlichter, C. L., & Palmer, W. R. (2002). Talents unlimited: Thinking skills instruction as enrichment for all students. *Research in the Schools, 9*(2), 53-60.

Scott, G., Leritz, L. E., & Mumford, M. D. (2004). *The Effectiveness of creativity training: A quantitative review. Creativity Research Journal, 16*, 361-388.

Spohn, C. (2008). Teacher perspectives on No Child Left Behind and arts education: A case study. *Arts Education Policy Review, 109* (4), 3-11.

Standing, E. M. (1984). *Maria Montessori: Her life and work.* New York, NY: Penguin.

Stephan, E., Liberman, N., & Trope, Y. (2010). The effects of time perspective and level of construal on social distance. *Journal of Experimental Social Psychology, 47*(2), 397-402.

Stewart, R. A., Rule, A. C., Giordana, D. A. (2007). The effect of fine motor skill activities on kindergarten student attention. *Early Childhood Education Journal, 35*(2), 103-109.

Subbotsky, E., Hysted, C., & Jones, N. (2010). Watching films with magical content facilitates creativity in children. *Perceptual and Motor Skills, 111*, 261-277.

Taylor, G., Shepard, L., Kinner, F., & Rosenthal, J. (2001, September). *A survey of teachers' perspectives on high-stakes testing in Colorado: What gets taught, what gets lost*. Boulder, CO: CRESST/CREDE/University of Colorado at Boulder. ERIC Document Information System No. ED 475139.

Torrance, E. P. (1962). *Guiding creative talent.* Englewood Cliffs, NJ.: Prentice-Hall.

Torrance, E. P. (1963). *Education and the creative potential. Modern school practice series*. Minneapolis, MN: The University of Minnesota Press.

Torrance, E. P. (1966). *Torrance tests of creative thinking: Norms technical manual.* Princeton, NJ: Personnel.

Torrance, E. P., Ball, O. E., & Safter, H. T. (1992). *Torrance tests of creative thinking: Streamlined scoring guide. Figural A and B.* Bensenville, IL: Scholastic Testing Service.

Treffinger, D. J., & Isaksen, S. G. (2005, Fall). Creative problem solving: The history, development, and implications for gifted education and talent development. *Gifted Child Quarterly, 49,* 342-353.

Trilling, B., & Fadel, C. (2009). *21st Century skills: Learning for life in our times.* Hoboken, NJ: Jossey-Bass

Trope , Y., & Liberman, N. (2010). Construal-Level Theory of Psychological Distance. *Psychological Review*, *117*, 440-463.

Trope, Y., Liberman, N.,& Wakslak, C. (2007). Construal levels and psychological distance: Effects on representation, prediction, evaluation, and behavior. *Journal of Consumer Psychology*, *17* (2), 83-95.

United States Government Accountability Office. (2009). *Access to arts education: Inclusion of additional questions in education's planned research would help*

explain why instruction time has decreased for some students. Report to Congressional Requesters. GAO-09-286. Retrieved May 24, 2012 from http://www.gao.gov/new.items/d09286.pdf

University of North Carolina (2012). *Counterbalancing in the Design of Experiments.* The University of North Carolina. Retrieved March 12, 2012 from http://www.unc.edu/courses/2008spring/psyc/270/001/counterbalancing.html

Wallas, G. (1926). *The art of thought.* New York, NY: Harcourt, Brace, & World.

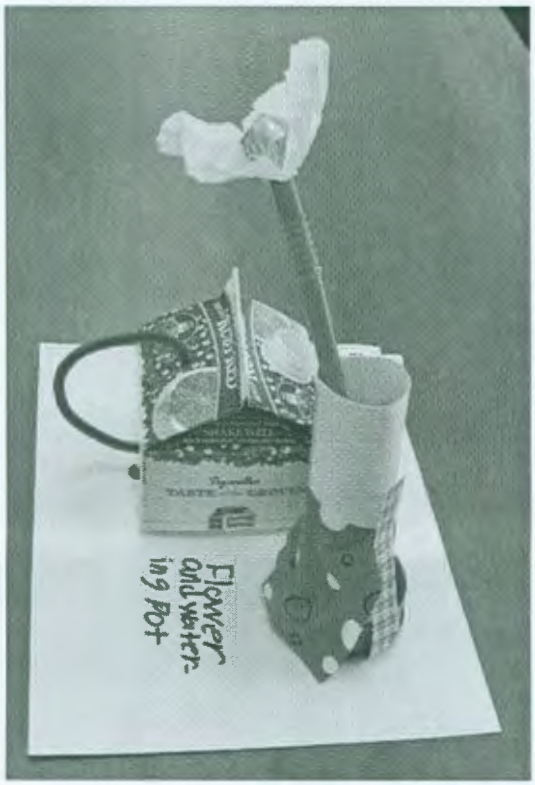
Webb, A. N. (2013). *Comparing second grade students' creative an content knowledge performance on figural transformation activities introduced in a standard or enhanced manner with nutrition content knowledge taught through factual or fantasy readings.* (Doctoral dissertation.) University of Northern Iowa, Cedar Falls.

Wolfe, D.,A., & Bramwell, A. (2008). Innovation, creativity and governance: Social dynamics of economic performance in city-regions. *Innovation: Management, Policy & Practice, 10*, 170-182.

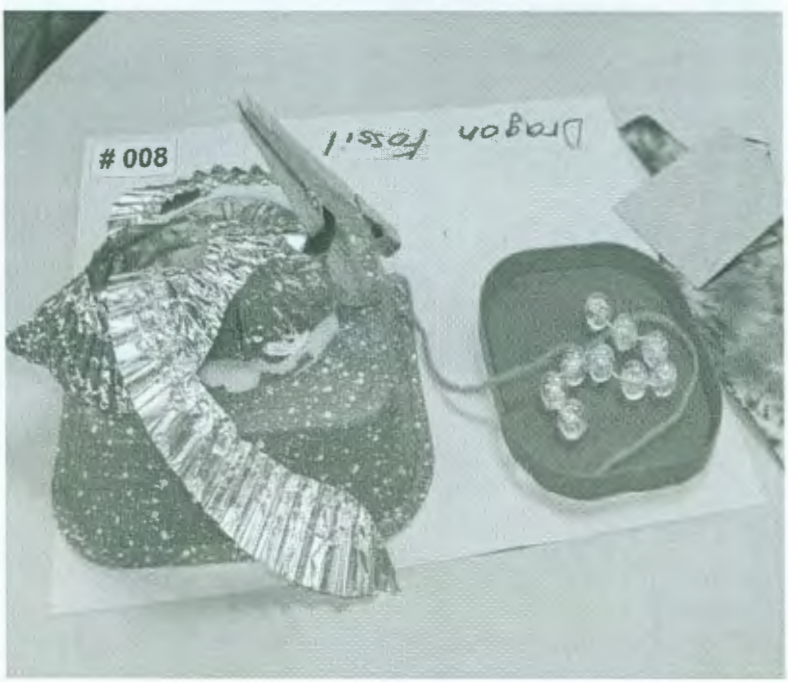
Word play. (2012). In *Dictionary.com – Online dictionary.* Retrieved from http://dictionary.reference.com/

APPENDIX

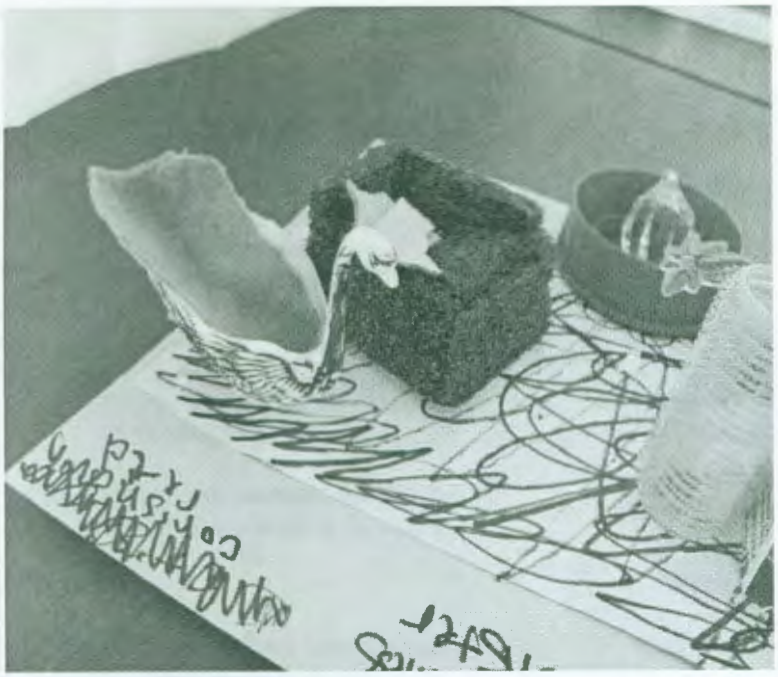
EXAMPLES OF STUDENT WORK



Title: Flower and Watering Pot
Given Theme: Geometric Shapes
Description: The student incorporated different forms and shapes into this construction, such as cylinder and semi-circle. The construction skills of increasing the contact area when gluing and making a flange were used. The use of the cardboard juice box top as a watering can was unique.



Title: Dragon Fossil
Given Theme: Fossil Life
Description: The student created a dragon which is guarding precious fossils. Many of the objects were modified: the foil cupcake liner was cut and used to make the dragon's wings and body, the student also drew the dragon's face on the clothespin which represents the dragon's head. The construction had many small details, such as the rope with which the dragon was tied to the mountain, teeth, and eyes of the creature along with a colorful piece of the dragon skin on its back.



Title: The Loch Ness Monster
Given Theme: Natural Disasters
Description: The scene depicts the pollution resulting in mutation of a swan into a Loch Ness monster. The student used a marker to show polluted water and to draw a scary facial expression on the monster. The student also added an element of fantasy by using the gem as a vessel in which the power of the monster was hidden, an abstract idea.

Title: Imagination Runs Wild
Given Theme: My Free Time
Description: The story behind this work is that a book of funny poems for children was opened and all the characters escaped. The characters include: a flat girl who was run over by a giant wheel, a person who was tied to a totem pole (the penguins) and could not come down, and an alligator engaged in eating someone's leg.

Examples of Student Writings

Given Theme: Backyard Birds
Writing Type: Short Poem

Dog will bark,
Birds will tweet,
Eat this meat,
And they will speak.
⁂

Given Theme: My Free Time
Writing Type: Couplet

Paintballing hurts so much, but it is fun.
I can't wait till next week to do a re-run.
⁂

Given Theme: Ways I Communicate
Writing Type: Rap

Phones, Emails, all around,
Everywhere I go, I can't stop hearing their sounds.
I hate to hear the sound but what I can do?
I text too and so do you!
⁂

Given Theme: Healthy Lifestyle
Writing Type: Jump Rope Rhyme

I went outside to play ball,
I made a mistake and
Played all day long.
I was dehydrated and
I drank bottles of water.
How many did it take? 1.2.3.4.5.6.7.8.9.10
⁂

Given Theme: Fossil Life
Writing Type: Book Title

Life under the Sea Millions of Years Ago!
⁂

Given Theme: Doing My Part to Help the Earth
Writing Type: Advertising Slogan

Come serve the Earth. Our home needs help.
⁂

Given Theme:
Writing Type: Movie Title

Super Swimming Super Hero Wins Olympic Games then Flies to Outer Space
⁂

Given Theme:
Writing Type: Fortune Cookie Wisdom

If you can read this, good things will happen.
⁂

Given Theme: Fairy Tale, Myth, Science Fiction
Writing Type: Character Description

Pretty Princess, live far away, long hair, stuck somewhere.
⁂

Given Theme: Fairy Tale, Myth, Science Fiction
Writing Type: Newspaper Headline

New fairy tale movie came out today!
⁂

Given Theme: Healthy Lifestyle
Writing Type: Epitaph

Andy did not exercise, so he died and dried very fast, so now he can't be of a smaller size
⁂

Given Theme: Global Climate Change
Writing Type: Riddle

Where are the whales? In our water supply.
⁂